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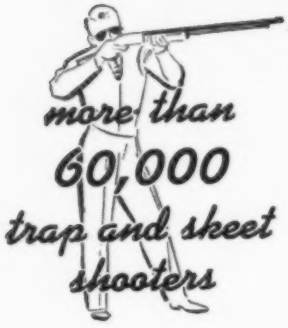

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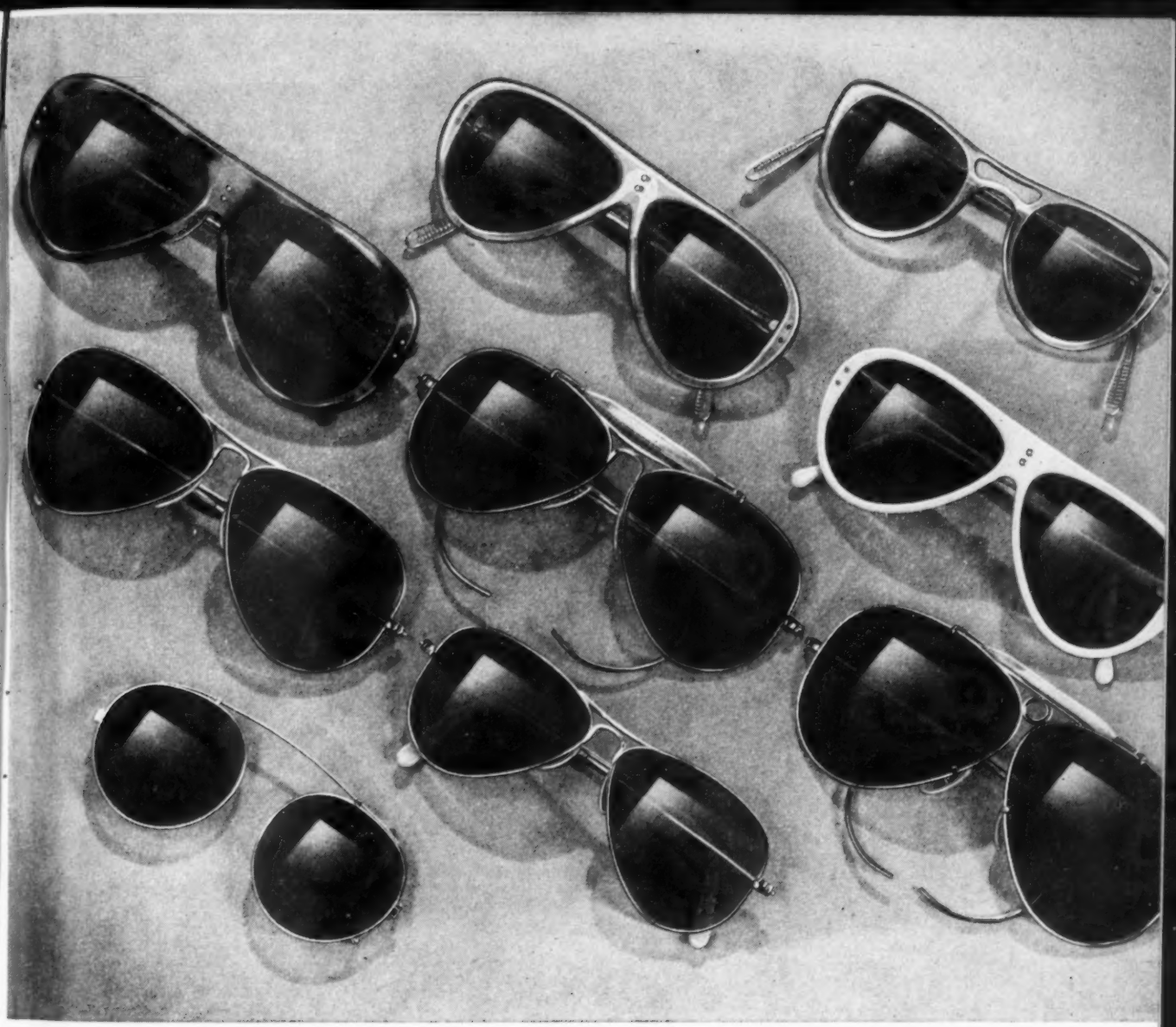

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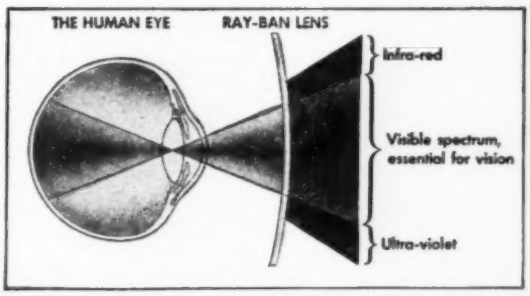

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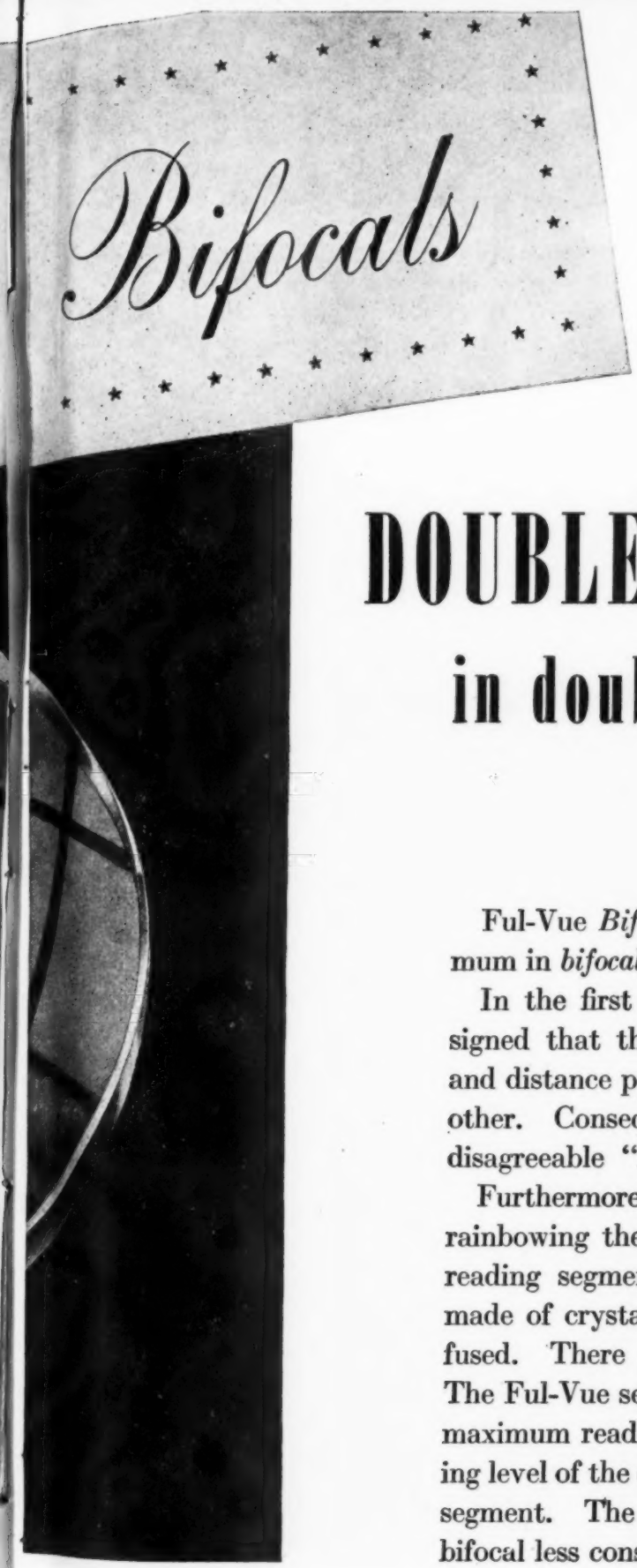

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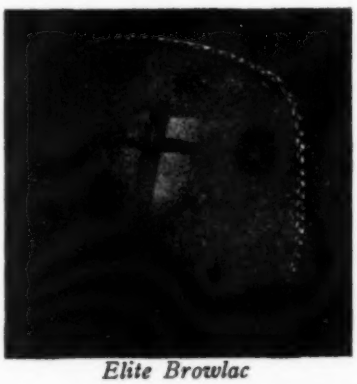

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ON THE TECHNIQUE OF MEASURING AND CORRECTING ANISEIKONIA*

Robert E. Bannon
Dartmouth Eye Institute
Hanover, N. H.

Introduction:

In general, glasses are prescribed to enable patients to see clearly, or more comfortably, and therefore more efficiently. The correction of such refractive errors as hyperopia, myopia, astigmatism, and presbyopia by suitable lenses has been a routine process for many years. Also, the correction of muscular anomalies such as esophoria, exophoria and the hyperphorias by means of prisms is well known.

Principally, the eye specialist has been concerned (aside from pathological conditions) with providing a clear image on the retina of each eye with a minimum of ocular effort on the part of the patient. The assumption has been made that when this has been done for each eye individually, the two eyes will cooperate efficiently in single binocular vision. We must realize that the image from each eye, to become effective, must by way of neural pathways reach the visual centers in the brain and there be united into a composite single image which is perceived in space. This completes what we term "vision."

The Dartmouth Eye Institute has been concerned with the nature of the unification of the two ocular images and as a result of research has concluded that besides the clearness or the proper focusing of the image for each eye, there is another characteristic relating to the images of the two eyes which demands attention, that is, *the relative size and shape of the images.* When the ocular image of one eye differs in size or shape from the other, although both are well focused, then the patient is said to have aniseikonia. *Fig. 1* shows diagrammatically the various types of incongruities that may occur between the ocular images.

*An abridgment of the material presented before the American Academy of Optometry. For publication in the April, 1941, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

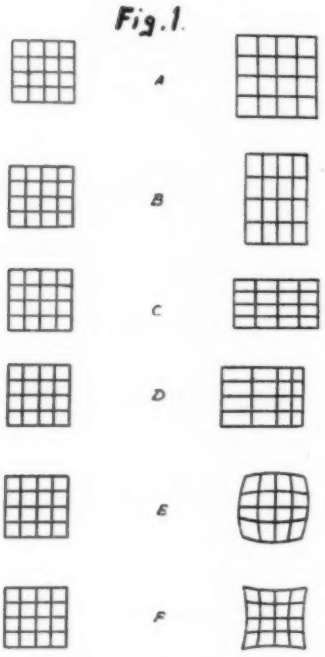

Figure 1. Types of size and shape differences. (A) represents the type wherein the ocular image of one eye is symmetrically larger or smaller than that of the other eye. (B) represents the type wherein the ocular image of one eye is symmetrically larger or smaller in one meridian than that of the other eye. This effect is produced in meridional aniseikonia. (C) where the ocular image of one eye is larger in one meridian and smaller in the other, than that of the other eye. (D) where there is a lack of symmetry and the ocular image in one eye is progressively smaller for the right field and progressively larger for the left field than the other eye. An ordinary flat prism will produce this effect. (E) and (F) are barrel or pin-cushion distortion effects due to progressive enlargement or diminution in all directions from the axis of vision. (By permission, Theo. E. Obrig.)

For many years it has been recognized that differences in the size of the ocular images may exist in the correction of antimetropia, or high anisometropia, the extreme case being represented by unilateral aphakia. Donders[1] (1864) discussed in some detail the differences in the relative size of the images of the two eyes due to anisometropia, and mentioned that these differences may disturb, or even make impossible, binocular single vision. Donders ascribed the difference in the relative size of the two images and the attending difficulties to dioptric causes, whereas C. Hess[1] (1905) believed that symptoms which are so frequently mentioned in conjunction with the correction of higher degrees of anisometropia by glasses are caused by the prismatic secondary effects of the

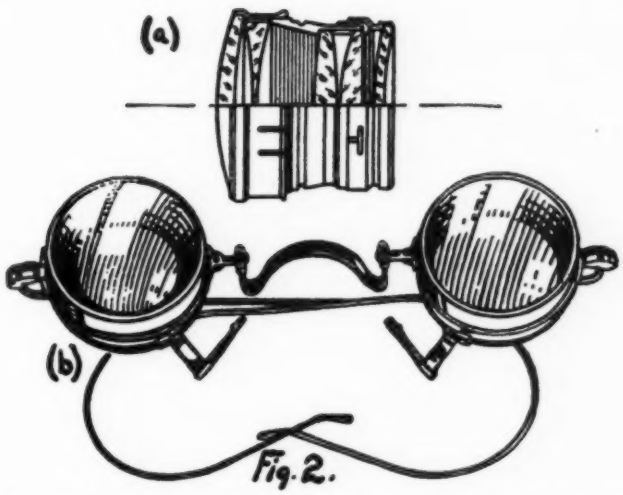

Figure 2. Diagram of von Rohr's anisometropic spectacles. From Henker's, Introduction to the Theory of Spectacles. (a) Anisometropia combination with outside and inside lens attachments. (b) Anisometropia spectacles.

periphery of the lenses. Von Rohr[2] (1912) has designed spectacles *(Fig. 2)* for the correction of the ametropia and calculated image-size difference in the case of unilateral aphakia or high anisometropia.

Erggelet[3] pointed out that the correction of astigmatism would introduce changes in the size of the retinal image, but he concluded these changes were negligible because they rarely exceeded 4 to 5 per cent.

All these discussions so far mentioned have been based upon calculated image size differences of a physical origin. Erggelet[1] (1916) was perhaps the first to mention the possibility that this image size difference might also have a physiologic origin, that is, that it might be based upon an unequal distribution of the retinal elements in the two eyes, and that special methods would be necessary to measure it.

A statistical analysis by Carleton and Madigan[4] of the data on aniseikonic cases examined at Dartmouth showed that aniseikonia can be found not only in anisometropic patients, but also in cases of bilateral emmetropia and equal ametropia of the two eyes; it was also pointed out that there were cases where, in view of the existing anisometropia, the differences measured in the relative size of the ocular images were opposite from those expected on the basis of geometric optics.

It is possible that some confusion has resulted by referring to certain text books on physiologic optics wherein it may be found that, theoretically, there is no significant difference in the size of the *retinal* image of a moderately axial ametropic eye when corrected by a spectacle lens. One should note that such calculations are based on several postulations, for instance, the inanimate schematic eye of Gullstrand, and also that the correcting lens is infinitely thin and that it is placed exactly in the anterior focal plane of the eye, etc.; which postulations do not always hold in dealing with living eyes, and materially thick lenses.

The contributions of the Dartmouth Eye Institute to the field of physiological optics, have enabled, by the development of special instrumentation and lenses, the determination of the amount by which the relative size of the ocular image of one eye differs from its fellow when the existing refractive error of the two eyes has been corrected, and once this is done, to determine correcting spectacle lenses which will equalize any difference in image size without altering the necessary refractive power.

Definitions:

ANISEIKONIA—THE RELATIVE DIFFERENCE IN SIZE AND/OR SHAPE OF THE OCULAR IMAGES

The definition of aniseikonia utilizes the term "ocular image" which embraces not only the retinal image formed by the dioptrics of the eye but also the modifications imposed on this retinal image by the distribution of the nerve endings in the retina and possibly by the arrangement of the visual centers in the cortex.

Another term in the definition of aniseikonia which may need explanation is the word "size." Obviously, some unit of measurement must be stated that is understandable and applicable. Since the measurement of the *absolute* size of the *ocular* images is indeterminable and meaningless, we can only measure the *relative difference* in size, and we express this difference in terms of the *per cent magnification of zero-power lenses necessary to equalize the size of the two images.*

Restating, then, our definition of aniseikonia: it is the relative difference in size or shape of the ocular images of the two eyes, expressed in per cent magnification.

Technique for Measuring Aniseikonia:

Preceding the examination for aniseikonia the patient's history and symptoms are recorded: especially, the CHIEF COMPLAINT and whether

this occurs in distant or near vision, or whether this complaint is at all associated with the use of the eyes. The onset, duration, and frequency of the symptoms are noted, as well as the means already used by the patient to obtain relief. Individual cases vary, of course, and make necessary modifications in the history taking, but it is very helpful to the examiner if he knows as much as possible about the patient's medical history and symptoms, so that in deciding on the justification of prescribing a correction for ametropia or aniseikonia, he will be guided not only by the measurements he has taken, but also by the nature of the patient's symptoms. It may happen in certain cases that, from the nature of the patient's symptoms and the character of the ocular findings, it is best to advise a physical, dental or neurological examination before an aniseikonic correction is considered.

The patient's eyes are, of course, examined for ocular pathology and for refractive errors by means of the ophthalmoscope, keratometer, retinoscope, and subjective methods. The phorias, fusional amplitudes, and field tests, if indicated, are also taken. If, from these preliminary investigations, the findings seem to explain the symptoms of which the patient complains, he is advised, of course, not to have the examination for aniseikonia; at least not until the usual therapy, for instance, a correction for a significant change in the refraction, has been tried for a few months.

The examination for aniseikonia entails the use of special instrumentation, and it is very interesting to glance briefly at the developments that have transpired in the matter of instrumentation. In 1928, Ames and Gliddon published their paper "Ocular Measurements" (Trans. of Sect. on Ophth. of the A.M.A.: 1-68, 1928) in which they described their experiments on measuring the accommodation and fusion on the Haploscope* *(Fig. 3)*. They found through personal observation and by examining many other subjects, a condition which they first designated as "retinal asymmetry." The procedure was as follows: the subject, seated at an instrument, subsequently called the Ophthalmo-Eikonometer *(Fig. 4)*, which is an elaborate haploscope, was asked to fixate binocularly and in symmetrical convergence a black disc in the center of a white screen, optically located at a visual distance of 20 feet. In the vertical meridian, above and below this black disc, as well as in the horizontal meridian on either side at distances of 4°, there were small

*A haploscope is essentially a reflecting stereoscope.

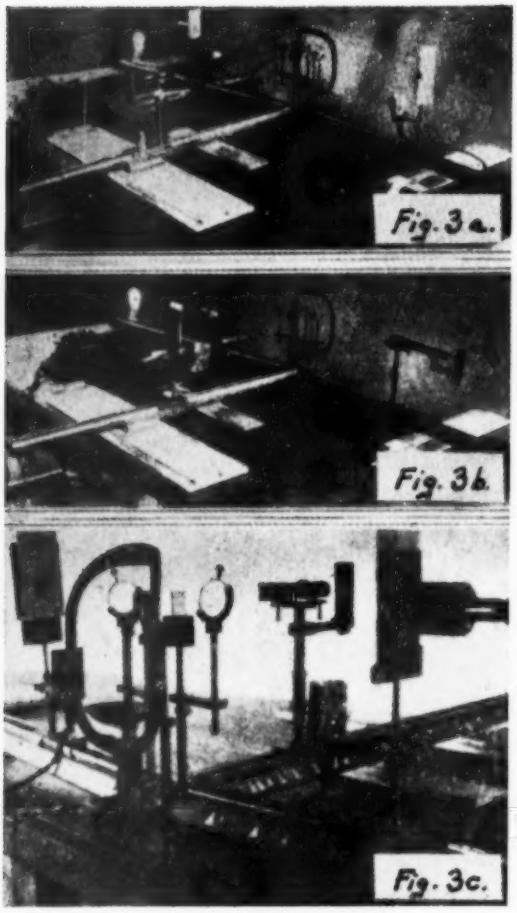

Figure 3. Haploscope apparatus used by Ames and Gliddon and described in their paper, "Ocular Measurements." Transactions of the Section on Ophthalmology of the American Medical Association, 1928, 1-68. (a) apparatus with set-up of targets and light source for measuring horizontal and vertical fusional amplitudes and relative accommodation. (b) apparatus with set-up of light sources and target for measuring accommodation and horizontal and vertical phorias. (c) apparatus showing arrangement for adjusting the centers about which the arms rotate and the head rest. (By permission, Trans. Sect. on Opthalm. of the A. M. A.)

openings, which, because of their construction, were visible as dark spots to one eye and as luminous points to the other *(Figs. 5 and 6)*. When the subject's refraction had been carefully corrected and the conjugate foci of the two eyes balanced, he was asked to compare the relative distances of the light and dark spots from the central disc. He might report that he saw not only the binocularly fixated disc single, but also

coincidence of the uniocular images of the dark and luminous points, indicating that the images of both eyes were identical in size *(Fig. 7)*.

Usually, however, the subjects reported that the small dots seen by one eye were not in coincidence with the bright points of light seen by the other eye, although the binocularly fixated disc was seen singly. As will be seen, this lack of coincidence may be due to a number of causes; for instance, a slight heterophoria may become manifest, due to the relaxation of the fusion impulse when the gaze is shifted from the binocularly seen black disc (which, of course, demands or enforces fusion),

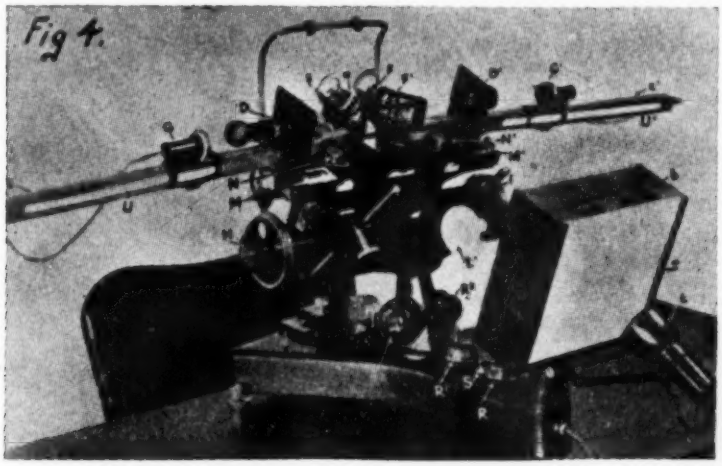

Figure 4. The opthalmo-eikonometer set for near test. L, lamp; T, frame for near size target; b, near size target; L^1, lamp illuminating anterior surface of near target; R, R^1, R^2, R^3, rheostats; I, wheel for moving refraction target G and G^1 by means of strings; H, knurled knob for turning wheel I; U and U^1, side arms, on which travel refraction targets, also carry dioptric scales for measuring patients ametropia D, shield with +5.00 diopter lens to occlude undue reflections; M, cam controlling near point of convergence; N, N^1, set screws; S, power lens cells; a, adjustable iseikonic lens cells; F, F^1, half chromium plated mirrors. (By permission, Theo. E. Obrig.)

to the monocularly seen black dot and bright light for which there is no fusion impulse because of their dissimilarity. The relative separation of the light points with respect to the dark spots which we term "fixation disparity," depends on whether the subject has esophoria, exophoria, or a hyperophoria *(Figs. 12, 13 and 14)*, and also depends on the relative size of the images seen by each eye. When the light points are all displaced an equal amount and in the same direction from their corresponding dots, there is no manifest difference in the relative size of the two images, but when, for instance, the lights are displaced an unequal

Figure 5. Dots seen by the left eye. Figure 6. Lights seen by the right eye.

distance relative to the dots—or in opposite directions—then there is evidence of an inequality in the sizes of the ocular images. From the accompanying *Figs. 8 and 9*, it is clear that there may be a symmetrical difference in the relative size of the ocular images, that is, one image may be larger than the other both in the vertical and horizontal meridians: this is called an "overall size difference." There may also be the case where one meridian is smaller than the corresponding meridian of the other image *(Figs. 10 and 11)*. Aniseikonia and heterophoria may coexist in certain cases and then the arrangement of the light points relative to the dark spots will be like that depicted in *Fig. 15*.

The amount by which one ocular image is larger or smaller than the other is measured by placing before the patient's eyes appropriate "size" lenses which will cause equal displacement of the lights and dots. These lenses are from a set of specially designed zero-power-magnifying lenses made in 0.25 per cent magnification steps. These sets have now been superseded by a single adjustable unit somewhat on the principle of a small adjustable telescope *(Fig. 16)*. It is obvious that ordinary spherical or cylindrical power lenses cannot be used in measuring aniseikonia, since, despite the fact that they introduce magnifying power, they also alter the refraction so that one or both of the images becomes blurred. (See Table No. 1.)

The method just described had been used to measure aniseikonia until Polaroid became commercially available a few years ago. This material made it possible to utilize a much simpler technique, although the underlying principles are the same as those previously mentioned.

Fig. 4 shows the ophthalmo-eikonometer which has been used for the past eight years, and *Fig. 17* shows the most recent model, called the "Eikonometer." *Fig. 18* gives a schematic plan of the new method of projecting on a metal-coated screen, a figure consisting of four pairs

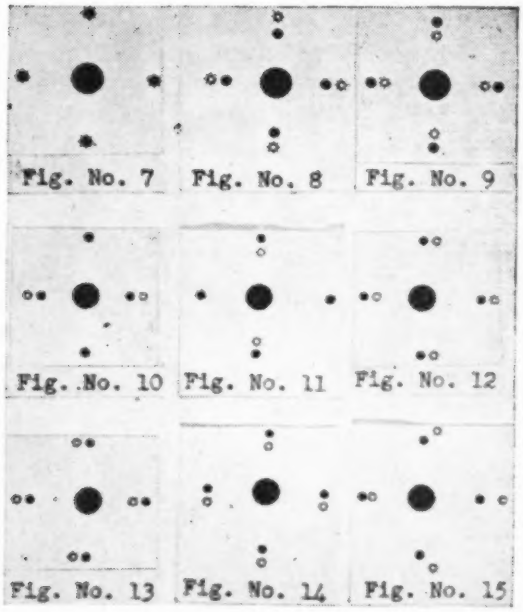

Figure 7. Iseikonia: Lights and Dots coincide. Figure 8. Aniseikonia: R.E. image larger than L.E. image overall. Figure 9. Aniseikonia: R.E. image smaller than L.E. image overall. Figure 10. Aniseikonia: R.E. image larger than L.E. image in horizontal meridian only. Figure 11. Aniseikonia: R.E. image smaller than L.E. image in vertical meridian only. Figure 12. Lights show eso-fixation disparity. Figure 13. Lights show exo-fixation disparity. Figure 14. Lights show instead hyper-fixation disparity. Figure 15. Lights show eso-fixation disparity and R.E. image larger than L.E. image overall.

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of opposing arrows and a central fusion object. The odd-numbered arrows are polarized so that with the appropriate Polaroid plate in front of the right eye, these arrows will be seen by that eye only, whereas, the even-numbered arrows are so polarized that they will be seen only through the proper Polaroid plate by the left eye. As is usually the case, the Polaroid plates are so arranged that the right eye will see only the odd-numbered arrows and the left eye will see only the even-numbered arrows. Therefore, when, as in *Fig. 19*, the arrows seen by the right eye all appear to be exactly opposite the arrows seen by the left eye, the conclusion is that the relative size of the ocular images is equal. *Fig. 20* shows what the patient will see when the right ocular image is relatively *larger* than the left in both the horizontal and vertical meridians, and *Fig. 21* illustrates the contrary condition. *Figs. 22, 23,* and *24* show what the patient will report as to the relative positions of the arrows

if he has an exo-, an eso-, or a hyper-fixation disparity, respectively; it is to be noted that the displacement of the odd-numbered arrows is symmetrical with respect to the even-numbered arrows, and therefore the evidence is, that the relative size of the ocular images is the same. However, *Fig. 25* is an example of what the patient would see if he had, not only an eso-fixation disparity, but also an aniseikonia, the right ocular image being relatively larger than the left, both horizontally and vertically. It can be readily realized that there are quite a number of combinations possible. *Fig. 26* shows what the patient would see when the right ocular image is relatively smaller than the left in the vertical meridian only, whereas *Fig. 27* represents the condition of the right ocular image being relatively larger than the left in the horizontal meridian only.

TABLE No. 1*

Table showing the change in the size of the dioptric image of an object placed at 6.1 m., when different power lenses are placed at the anterior focus of one eye.[10, 11, 12]

Dioptric Power of Lens	Mag. of Blurred Image. Eye Focused at 6.1 m. at All Times	Mag. of Sharp Image. Eye Accommodated or Relaxed to Absorb Lens Power
+10.0	26.8%	22.5%
+ 7.5	18.8	15.7
+ 5.0	11.8	9.8
+ 4.0	9.2	7.6
+ 3.0	6.8	5.5
+ 2.0	4.4	3.6
+ 1.0	2.2	1.7
+ 0.0	0.0	0.0
— 1.0	— 2.1	— 1.8
— 2.0	— 4.0	— 3.4
— 3.0	— 6.0	— 5.0
— 4.0	— 7.8	— 6.5
— 5.0	— 9.5	— 7.9
— 7.5	—13.7	—11.4
—10.0	—17.4	—14.5

("Lenses for Changing the Size and Shape of Dioptric Images"—Ames, Gliddon, and Ogle. The Annals of The Distinguished Service Foundation of Optometry, III, 1932.)

The distance that one pair of arrows, for instance, 5 and 7, is displaced relative to its mates, 6 and 8, is no indication of the *amount* that one image differs from the other, since there are no scale markings

*This table is based on the assumption that the ametropia is refractive rather than axial.

on the targets, because such would stimulate fusion and thereby prevent the disparity in image size from becoming manifest. In order to measure the amount that one image differs from the other, it is convenient to use an adjustable size lens unit which is a part of the instrumentation. This unit consists of two lenses which neutralize each other with respect to refractive power, but because of their separation, give a magnification of a calculated amount proportional to a given separation. The drum regulating the separation of the two lenses constituting the telescopic sys-

Figure 16. The new model of the adjustable size (magnifying) units used with the Eikonometer.

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tem is calibrated in tenths of a per cent magnification, so that one can readily read the amount of magnification necessary to align the arrows, or to give an equal symmetrical displacement of the arrows.

The tests for aniseikonia are carried out at the visual distance of 20 feet, for which the target of arrows is projected on an aluminum sprayed screen, as described, and the tests are also conducted for the visual distance of 16 inches by using a negative photographic plate on which there is a pattern consisting of intersecting lines, a system of opposing arrows, and a central ring. This plate, as represented in *Fig. 28*, is illuminated from behind. Pieces of polarizing film are so placed over the arrows and numbers that the light passing through the odd numbered arrows and figures is polarized in one plane, while the light pass-

ing through the even numbered arrows and figures is polarized in a plane at right angles to that of the other arrows. The central ring and intersecting lines are not polarized. Polaroid plates are mounted before each eye, with the planes of polarization at right angles to each other so that the odd numbered arrows are visible to one eye only, and the even numbered arrows are visible to the other eye only, whereas the patient sees the central ring and intersecting lines binocularly. Fusion is held by this central ring and these intersecting lines, and, as has been

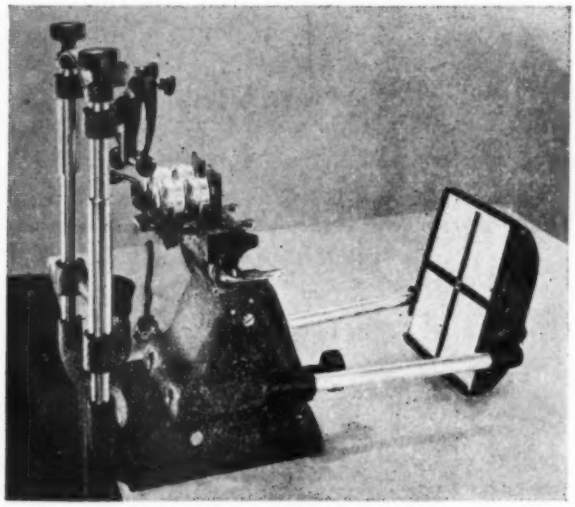

Figure 17. The Eikonometer. The new model of the instrument used for measuring aniseikonia.

indicated,[5] they are sufficient, in general, to control the relative directions of the eyes when looking from the center of the target to any particular set of opposing arrows.

It will be appreciated that the limits of accuracy[6] in measuring aniseikonia in a pair of dynamic eyes is subject to much the same influences as measuring the phorias or the fusional amplitudes, and therefore some system of "amplitudes" or "limits" must be followed. While it is generally conceded that a one-to-one relationship between the lateral (horizontal) fusional amplitudes is not to be expected, since our convergence faculty is called upon for much more exertion than is our divergence ability, nevertheless, we do expect that our vertical fusional amplitudes (infra and supra vergence power), be equal in magnitude. We all utilize this latter point in the determination of the amount of

a hyperphoria, and by taking a mean of our vertical vergence power findings, we are able to arrive at the amount of prismatic correction for a particular hyperphoria; that is, if a patient is only able to overcome 2△ base-up before the right eye and 4△ base-up before the left eye, the common conclusion would be that a correction of 1△ base-down on the right eye is indicated, so that with this correction, the patient would be in the middle of his vertical fusional amplitude, that is, he would be able to overcome 3△ base-up over the right eye and 3△ base-up over the left eye.

Analogously, in the technique of measuring aniseikonia, we employ "the method of limits," which is a standard technique in measuring physio-psychological functions similar to that mentioned above in the case of hyperphorias. When a patient, being tested for aniseikonia, reports initially that all the arrows are aligned, or, for instance, that they all become aligned readily by merely changing the magnification in front of the right eye from 0% to 1.00%, we would consider the findings in neither case sufficient to justify an expression with respect to the amount of aniseikonia, nor the correction indicated. As in the case of taking the fusional amplitudes, it is necessary to find the so-called "break" and "recovery" points, that is, the examiner should increase the magnification before one eye until the patient reports that the relative position of the arrows seen by that eye indicates that it is seeing the larger image; then the magnification should be decreased (by ½% steps) until the patient reports a change indicating that instead of seeing one image larger, both images are now equal. The same procedure is followed with respect to the other eye. For instance, we might find that we could increase the right eye image up to 2.00% overall (both horizontally and vertically) before the patient reported that the arrows seen by the right eye were so displaced from the corresponding left eye arrows, (as in *Fig. 20*), indicating the right ocular image to be larger than the left—and it was necessary to decrease the magnification to 1.50% on the right eye so that the "recovery point" or the place where the right ocular image again equalled the left was reached; whereas, for example, supposing that in this same case we found we could only increase the magnification in front of the left eye to 0.50% overall for a "break" point, i.e., the report that now the left eye sees the larger image, and we had to decrease back to 0% before equality—"recovery point"—is again reported. We have, then, obtained the following significant data: the "amplitude" or "limit" for the right eye is 2.00%

to 1.50%, whereas for the left eye it is 0.50% to 0%. We might express this conveniently as follows:

Horiz. Mer.	*Vert. Mer.*
R.E. 2.00 to 1.50%	2.00 to 1.50%
(Mean 1.75%)	(Mean 1.75%)
L.E. 0.50% to 0%	0.50% to 0%
(Mean 0.25%)	(Mean 0.25%)

and taking the mean of 1.75% and 0.25% we have $\frac{(1.75 - 0.25)}{2}$ or 0.75% as the indicated correction for the right eye.

There are, of course, many other possible examples, and in the cases of meridional size differences, we might obtain the following data:

H	V
R.E. 4.00 to3.00%	1.00% to 0.50%
(Mean 3.50%)	(Mean 0.75%)
L.E. 1.00% to 0%	1.00% to 0.50%
(Mean 0.50%)	(Mean O.75%)

from which we can see that the "limits" in the vertical meridian are equal, while in the horizontal meridian, it is necessary to add $\frac{(3.50 - 0.50\%)}{2}$ or $\frac{1.50\% \text{ ax. } 90}{}$ to the right eye in order to give equal amplitudes.

Still another example is the following:

H	V
R.E. 0.50 to 0%	1.75 to 1.25%
(Mean 0.25%)	(Mean 1.50%
L.E. 2.00 to 1.50%	0.75% to 0.25%
(Mean 1.75%)	(Mean 0.50%)

from which it is evident that the correction would be R. 0.50% x 180; L. 0.75% x 90.

Naturally, a certain amount of judgment, based on clinical experience, as well as on the findings, is required in prescribing aniseikonic corrections, just as judgment is essential in prescribing corrections for refractive errors or motor anomalies. While it is relatively easy to set down on paper the modus operandi of obtaining certain data, it is often different in actual practice, since much of our data on ocular functions, including aniseikonia, are necessarily based on the subjective type of examina-

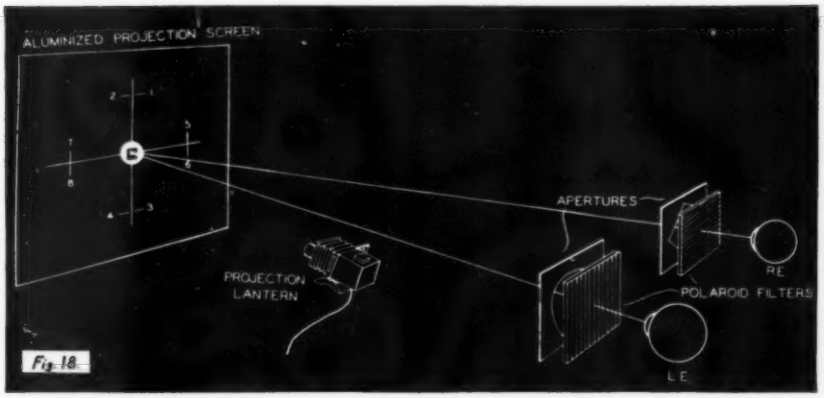

Figure 18. Schematic illustration of Eikonic target used with the Eikonometer for distance.

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tion, and as is well-known by any one with a little experience with patients, with an animated human being there are many variations from the expected as compared with the hypothetical patient-on-paper.

It might be well to state that we occasionally find a different amount of aniseikonia for distance (20 feet) than we do for near point (16 inches), despite the absence of a dioptric cause to explain this. Also, in cases that have been examined repeatedly over the course of many years, we sometimes find changes in the measurement of the aniseikonia which do not correspond to dioptric changes. These and other apparent inconsistencies should not, however, appall us, for we are aware that the same variations occur with respect to ametropic errors as well as with respect to the heterophorias. It is always a moot question when we examine a case the second time after a year's interval and find, for instance, a different measurement of the refractive error, whether or not the refractive condition of the eye did actually change in the course of a year or whether, perchance, there had always been a certain total error which we were unable to measure in our first attempt; now, however, a year later, after having corrected for a year a part of that total error, we are able to find a still greater portion of the true error.

As the refractionist is assisted in noting the effect of his retinoscopic findings on the functional visual reaction of the patient by recourse to the subjective determination of the visual acuity, so also the aniseikonic clinician is aided similarly by noting the effects of his findings on the eikonometer with the functional reaction of the patient on the "tilting

board."[7,8] This latter makes, to some extent, use of the principles of the horopter which, it will be remembered, is defined as comprising the totality or locus of points which are imaged on corresponding retinal points in a specific position of the eyes. Theoretically, the simplest geometric longitudinal horopter is a circle passing through the fixation point and the entrance pupils of the two eyes (the so-called Vieth-Müller circle). Practically, however, for a normal pair of eyes, the curve obtained is somewhat flatter than the circle-horopter curve. If the images of the two eyes differ in size, the horopter (and likewise, the tilting board) is rotated in such a way that the normal horopter curve is shifted nearer to the eye with the smaller image. This fact is made use of with the tilting board in which comparative tests have shown that a difference of 1.00% in the lateral (horizontal) size of the images will cause a rotation of 4° from the horizontal.

Fig. 29 shows the tilting board with the chin and head rest. The observer looks through the square opening of a table top, at a movable irregularly-surfaced board attached to a universal joint below the top of the table. This board is controlled by means of ropes and pulleys so that it may be tipped sideways or longitudinally by means of handles conveniently placed at either side of the observer. If the ocular images are of equal size, or if the subject is able to make the necessary compensatory adjustment to equalize any difference in the relative size of the ocular images, he will set the movable board parallel to the table top. If, however, the image of the right eye, for example, is larger in the horizontal meridian than that of the left eye, and the patient makes no compensating adjustment, he will set the movable board tipped, rather than level, the left side lower than the right.

This device may be utilized much the same way as the visual acuity test, in that a patient may be found to have, on the eikonometer, a difference of 2.00% in the horizontal meridian, the right ocular image being relatively smaller than the left in the horizontal meridian. However, the patient may set the tilting board in such a way as to indicate that he needed only a correction of 0.50% x 90 on the right eye, rather than 2.00%, because he was able, apparently, to compensate for 1.50% of his error. The total correction of 2.00% x 90 on the right eye might at first make the patient set the tilting board considerably off, and make him complain that the floor, the sidewalk, and so forth, were tipped. In such a case, a partial correction would be first given, say 1.00% x 90

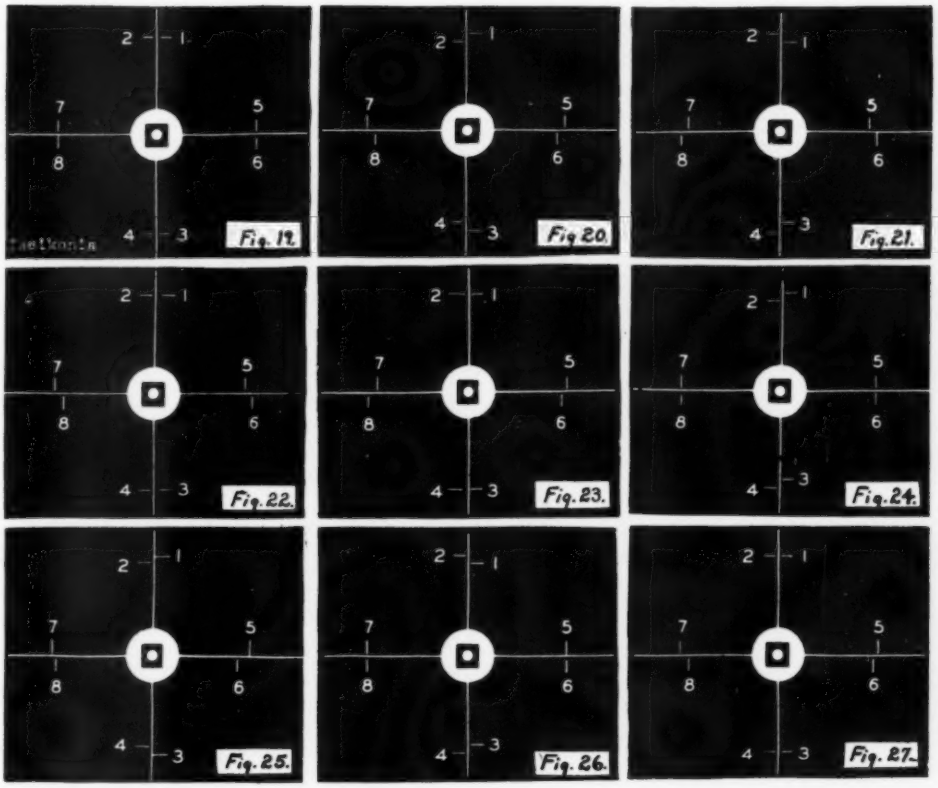

Figure 19. The odd numbered lines (seen by the right eye) appear opposite the even numbered lines (seen by the left eye) indicating that the relative sizes of the ocular images are equal. Figure 20. Aniseikonia: image of the R.E. appears larger than that of the L.E. Figure 21. Aniseikonia: image of the R.E. appears smaller than that of the L.E. Figure 22. Iseikonia: image of the R.E. appears displaced to the left showing an exo-fixation disparity. Figure 23, Iseikonia; image of the R.E. appears displaced to the right showing an eso-fixation disparity. Figure 24. Iseikonia: image of the R.E. appears displaced upward showing a vertical fixation disparity. Figure 25. Aniseikonia and eso-fixation disparity: image of the R.E. is larger in all meridians and is also displaced to the right. Figure 26. Aniseikonia: image of the R.E. is smaller in vertical meridian only. Figure 27. Aniseikonia: image of the R.E. is larger in horizontal meridian only.

in the right eye, which might later be increased to nearer the total amount.

It is very interesting that a difference in the relative size of the ocular images in the *vertical* meridian produces a falsification of horizontality much the same, but by only about half the amount on the large tilting board as does a horizontal size difference in the other eye. Theo-

retically, this is a very interesting phenomenon, since it is to be expected that differences in the size of the images in the vertical meridian would not cause the wrong setting of the horizontal plane, since the position of the horopter is not affected by vertically disparate images. Nevertheless, numerous investigations,[7, 9] by members of our Research Department, have shown that in cases of differences in the vertical size of the ocular images, the movable board, in order to appear horizontal, is tipped laterally in the same manner as though the horizontal meridian of the other eye were magnified by about half the amount of the indicated size difference in the vertical meridians. This phenomenon, which has been termed "the induced effect," may prove very helpful in providing a means whereby an estimation of a subject's image size difference may be obtained without recourse to the lengthy examination on the eikonometer. So far, at least, the results obtained by the eikonometer have been checked with the method of analysis by virtue of this "induced effect," and there has been some interesting correlation. Yet more cases are necessary, however, to adequately evaluate the comparisons between the eikonometer and the induced effect size analysis.*

Correction of Aniseikonia: It will appear obvious from what has preceded that the problem of designing spectacles to correct a difference in the relative size of the ocular images involves a matter of geometric optics. It is apparent, if one ocular image differs in size from the other, that it is necessary to compute lenses which will correct this difference in size without changing the refractive correction as determined

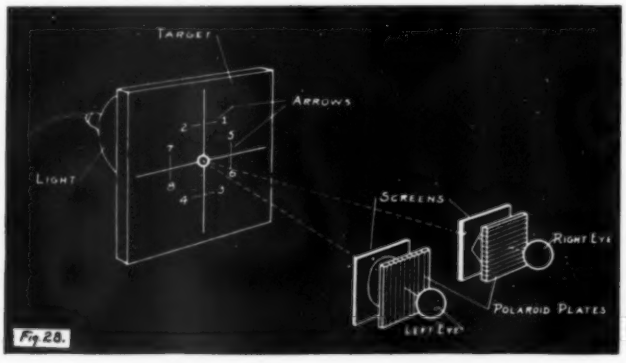

Figure 28. Schematic illustration of Eikonic target used with the Eikonometer for near.

*Kenneth N. Ogle: The Induced Effect. J. O. S. A., Vol. 30, 145-151, 1940.

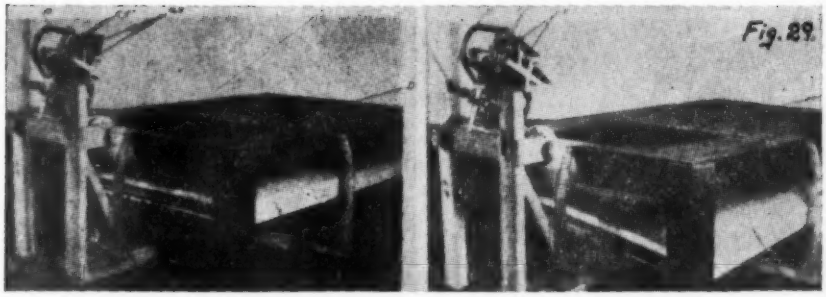

Figure 29. (Ames) The Tilting Field, designed to measure the apparent position of a surface as judged by stereoscopic vision only. (By permission, Am. Jour. Opthal.)

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by the method of conjugate foci. Papers have been written[10, 11, 12] giving the details as to how one ocular image may be magnified (or diminished) with respect to the other without changing the refractive power of the necessary ametropic correction. Briefly, and without the mathematics contained in these papers, it may be stated that magnification with respect to ophthalmic lenses depends on (a) refractive power, (b) curvature of lens, (c) thickness of lens, (d) distance of lens from eye. Since we must be restricted in changing the refractive power of the lens, and also since the distance the lens must be placed in front of the patient's eye is a rather fixed matter, depending on the type of frame selected and the anatomical characteristics of the patient's nose, brow and orbits, it is readily seen that the two remaining factors with which to work are *curvature* and *thickness* of the lens. A zero-power lens on a zero or 3 base curve will have less magnification than a zero-power lens on a 6, 9, or 12 base curve. (See Table 2). It is possible, then, to obtain an overall difference in magnification by simply having the lenses before each eye on different base curves. In order to obtain a meridional difference in magnification, as is required when one ocular image differs from the other in, say, the horizontal meridian (axis 90) only, it is necessary to have a bitoric lens with a much higher curve in the horizontal meridian than in the vertical meridian. Much advance has been made in the design of eikonic lenses, which now permits over 80% of the aniseikonic prescriptions to be filled by using conventional frames and mountings. A few years ago, it was only possible to design aniseikonic meridional corrections, especially bifocals, by using a doublet type of lens consisting of two bitoric lenses cemented together at the edges in such a way as to leave a small air space between the two lenses. These lenses could only

be made in *round* form, and necessitated a special deep-rimmed frame. It is now possible to obtain nearly all prescriptions in shapes other than round and in the conventional type of frames by a recent development devised by the *American Optical Company*, which makes use of a laminated type of bitoric lenses, rather than the air-space cemented-at-the-edges-only type of iseikonic lenses. *Fig. 30* shows four patients wearing aniseikonic corrections.

TABLE NO. 2

		Magnification	
Base Curve	Thickness	20 feet	40 cm.
0	2 mm.	+0.00%	+0.17%
—3	2 mm.	0.40	0.52
—6	2 mm.	0.80	0.88
—9	2 mm.	1.20	1.24

("Lenses for Changing the Size and Shape of Dioptric Images"—Ames, Gliddon and Ogle—The Annals of the Distinguished Service Foundation of Optometry, III, 1932.)

CONCLUSION:

Perhaps the best way to conclude this short presentation on some of the mechanics of measuring and correcting aniseikonia, would be to attempt to answer the question that is most frequently asked following the reading of papers dealing with aniseikonia; that is: "How can we justifiably refer or advise a patient to have the examination for aniseikonia when we are unable to determine, without the special instrumentation, whether or not the patient's symptoms are actually due to aniseikonia?" This question is best answered by drawing a parallel with what the physician does when he is confronted with a case in which the symptoms are, for instance, excessive physical fatigue and, with the instrumentation and knowledge at his command, can find nothing significant enough to account for the patient's complaint. The physician, let us suppose, does not have the equipment for an X-ray of the chest or for a basal metabolism test, but in view of the patient's symptoms, he deems such examinations necessary. In order to determine the possibility of tuberculosis as a basis for the patient's complaint, he will advise the patient to have an X-ray of the chest made at some hospital equipped for such examination. The patient will, of course, be grateful for his physician's interest in his case, and will certainly consider that his physician discharged his obligation by referring him for special examination

Figure 30. Photographs of patients wearing aniseikonic corrections. Case A. O.D. +1.00 ⊂ —0.25 x 180. O.S. +0.75 ⊂ 1.25% overall mag. Add +1.75 O.U. in bifocal. Case B. O.D. plano. O.S. plano ⊂ 0.75% OA ⊂ 0.75% x 90. Case C. O.D. plano ⊂ —4.25 x 6 ⊂ 2.50% x 110. O.S. +0.25 ⊂ —3.87 x 167. (Size in fitover lens.) Case D. O.D. +1.50 ⊂ —1.87 x 180 ⊂ 0.75% OA. O.S. +1.12 ⊂ —1.37 x 180.

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much more than if he merely arbitrarily gave some palliative, or stated that there was nothing wrong. As eye specialists, we may encounter a case in which the symptoms are not relieved by the most careful correction of the refractive errors, nor by a correction of a heterophoria, nor by orthoptics; it is then our moral as well as scientific responsibility, to advise a thorough physical, dental and neurological examination. If all of these prove negative, an examination for aniseikonia is warranted.

In short, then, it is advisable to refer a patient for the examination for aniseikonia if he has symptoms attributable to the use of the eyes, that is, if the eyes ache, pain, tire, or are otherwise uncomfortable and inefficient and/or the patient has headaches, dizziness, nausea while using or soon following the use of the eyes, *provided* the general physical condition has been pronounced negative by a competent physician, and also *provided* that the use of glasses correcting the usual errors of refraction and muscle imbalances have been tried without satisfactory results.

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NORMAL VALUES OF VISUAL FUNCTIONS AND THEIR APPLICATION IN CASE ANALYSIS. CASE TYPING AND CORRECTIVE PROCEDURE*

Part VI†

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After completing the examination as outlined in Parts IV and V of this report, all findings should be compared with their normals and checked as either normal, high, or low. The high and low findings should then be re-analyzed to determine whether or not they may be balanced or compensated by other factors, and reconsidered in respect to the case as a whole. If they seem to be compensated by other factors or appear to be normal for the individual under consideration, they are rechecked as being within normal limits.

A modification of Barstow's method of checking findings with a red and green pencil makes it easier for the optometrist and more interesting to the patient. Check all normal findings with a green check mark, and mark the highs and lows with a capital H or L in red. If on re-analysis an abnormal finding is determined to be within limits, draw a green circle around it.

There are two basic types of cases met with in ocular examination, the Pathological and Psycho-Physiological. It is the optometrist's duty to recognize both, but his chief interest and field of service lies with the second.

1. The *Pathological* may be subdivided into two groups—Primary and Secondary.

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The Primary group are those manifesting pathology of the eye, the orbit, and associated structures. They include injuries, inflammations, infections, and degenerative changes of the lids, lachrymal apparatus, conjunctiva, cornea, lens, iris, retina, choroid, sclera, and optic nerve; also paralysis of the extrinsic muscles. These fall within the field of the ophthalmologist and should be referred to him.

The Secondary group are the general systemic, infectious, toxic, glandular, and allergic conditions showing up in the fields, phorias, ductions, and accommodative amplitudes without ocular lesions. Necessary lenticular correction and visual care should be given, and the patient referred to the family physician (or dentist, if definitely dental). Only by such combined medical and visual care can best results be obtained, and only in this way can cooperation with the great body of medical practitioners be secured.

The Secondary group includes two sub-groups—(1) Stimulative; indicated by esophoria at 6 M and 40 cm., high positive convergence, low negative convergence, usually low reversions to fusion on all ductions, and possibly a low static compared with the subjective; and (2) Depressive: indicated by exophoria at distance and near, low convergence, low amplitude of accommodation for age, a history of fatigue, low vitality, etc. Many of the first group are toxic, either exogenous or endogenous. The second group may be either the secondary stage of the first; or due to general debility; glandular imbalances; excessive fatigue; loss of sleep; etc. Refer both groups for elimination or correction of the underlying cause and supply temporary visual care if necessary. Do not use orthoptics until this has been done. In many cases it will then be unnecessary.

2. The *Psycho-Physiological,* or Refractive Group, may be further divided into five sub-groups or types: the normal refractive, where all findings fall within normal limits, and four others manifesting imbalances between the functions of Accommodation and Convergence, either function being deficient or excessive in its action in relation to the other. Their characteristics and the procedure to be followed in each are:

I Normal Refractive Group

All visual functions lie within normal limits, visual acuity and amplitude of accommodation are normal for age.

Prescribe lens correction if required, allow maximum visual acuity with slightly less than maximum inhibition to accommodation for hyperopes, minimum correction for 20/30 or necessary V. A. for myopes. Give necessary advice on visual hygiene, reading habits, lighting conditions, etc. One or more basic orthoptics training periods to further balance functions and increase reserves may be prescribed if deemed desirable.

II Accommodative Deficiency

Amplitude of Accommodation—less than 4 D. or low for age.

Dynamic—Usually high in relation to normal range.

Cross Cylinder—Usually high in relation to normal range and near point phoria.

Positive Relative Accommodation—low, half Negative Relative Accommodation or less.

Negative Relative Accommodation—normal.

Phorias—usually eso due to over-stimulation of convergence by excessive innervation required to maintain accommodation.

Prescribe full inhibition to accommodation without interfering with acuity (depending on job, previous prescription, and visual acuity), either constantly or for near work only depending on case. (For myopes use minimum minus for 20/30 or necessary V. A.) Where possible, prescribe orthoptics to increase Positive Relative Accommodative Amplitude until at least more than one-half Negative Relative Accommodation finding and to increase total Amplitude to normal for age.

Prescribe extra plus at near point for non-presbyopic hyperopes only if orthoptics are impossible or ineffective; or as a temporary relief measure during orthoptic procedure. Add only enough to bring the Positive Relative Accommodation up to more than one-half of the Negative Relative Accommodation. For myopes, add plus to bring the Positive Relative Accommodation toward double the Negative and at least to the full Cross Cylinder. Prescribe bifocals if indicated. Increase total amplitude to at least 4 D. (minus lens) for non-presbyopes, continue orthoptics to reduce myopia and balance visual functions until this, or some decreased amount of minus, is acceptable as a single correction for distance and near or for distance only, if possible.

Decenter lenses for slight base-in effect at all distances to further relax accommodation indirectly through convergence.

III Convergent Deficiency

Total Convergence—low; less than double the convergence required for 40 cm. according to inter-pupillary distance. Nearpoint of convergence usually receded.

Phorias—high in relation to normal range and Cross Cylinder.

Positive Relative Convergence—low, one-half the Negative Relative Convergence or less.

Negative Relative Convergence—normal to high.

Total Negative Convergence—normal to high.

Positive Relative Accommodation—approaches total Amplitude of Accommodation.

Prescribe necessary lens correction (if required), allowing maximum acuity with slightly less than maximum inhibition to accommodation for hyperopes. For myopes use minimum minus for 20/30 or necessary V. A. Do not over-inhibit accommodation. Institute orthoptics to stimulate convergence until the Positive Relative is more than one-half the Negative; and total convergence at 40 cm, shows a reserve equal to the demand, based on P. D. and working distance. (This is double the requirement when measured from parallel.)

Decenter the lenses for slight base-in effect for relief of convergence. Prescribe base-in prism equal to *negative reversion* to fusion from positive convergence, if present. Incorporate it in the lenticular prescription or temporary fitovers.

IV Accommodative Excess (Ciliary Hypertonicity)

Refraction—frequently myopia with asthenopia.

Dynamic—frequently high in relation to normal range.

Cross Cylinder—usually low in relation to normal range and phoria at 40 cm. May show minus.

Amplitude of accommodation—high.

Positive Relative Accommodation—high.

Negative Relative Accommodation—usually low.

Phorias—usually eso, distance and near, due to excessive accommodation.

Prescribe full inhibition to accommodation for constant wear or reading only, depending on case. Where possible add additional plus or use temporary reading add up to the full amount of the Negative

Relative Accommodation, especially in myopes. For myopes use minimum minus for 20/30 or necessary V. A., and bifocals where indicated.

Institute orthoptics to inhibit over-accommodation, build accommodative reserve, and increase ability to exert and relax accommodation, easily. Stress proper reading habits. For myopes add plus at near point to bring the Positive up to as near as possible double the Negative Relative Accommodation. Continue orthoptics to reduce myopia and balance visual functions until the near point add, or some decreased amount of minus, is acceptable as a single correction for distance and near, or for distance use only.

V Convergence Excess

Phoria at 6 M—esophoria.

Phoria at 40 cm.—eso or ortho, low in relation to normal range and Cross Cylinder.

Positive Relative Convergence—high in relation to normal range and Negative Relative Convergence.

Total Convergence—high.

Negative Relative Convergence—normal to low.

Prescribe full inhibition of accommodation (depending on visual requirements) to assist in inhibition of convergence. Decenter lenses for slight prism base-in for inhibition of convergence. Institute orthoptics to relax excessive convergence.

A case may fall within any one of these groups, or in several possible combinations of groups. Prescribe the best lens correction possible under the circumstances, advise the patient how to use his eyes with a minimum of fatigue, and institute orthoptic procedure as indicated to increase reserves, and balance findings within normal limits.

Any of the five groups listed above may be further complicated by poor fusion, suspension or suppression, with or without amblyopia to various degrees.

Institute orthoptic procedure immediately to normalize vision, fusion, stereopsis. This may be done prior to or concurrently with the accommodative or convergent training.

3. Presbyopes.

Prescribe distance correction as though patient were a non-presbyope of the Group indicated. In general, maximum visual acuity should be

allowed at far point. Add plus for reading until at least one-half the total Amplitude of Accommodation is left in reserve, and the Positive Relative Accommodation taken through the add equals the negative. Use the *minimum* add commensurate with the patient's refractive findings, working distance, and visual habits rather than the maximum. This allows greater range of vision and tends to maintain accommodative reserves as long as possible.

4. All Cases.

Work toward normalization of visual functions with minimum interference by lens or prismatic correction.

Correct abnormalities of convergence directly as far as possible orthoptically rather than indirectly by altering the lens prescription. Increase accommodative inhibition or prescribe near point add in convergence excess only as a temporary measure during orthoptics or if orthoptics are impossible or ineffective; only where accommodative requirements are not violated; and only where phoria and duction tests, through the add, clearly demonstrate its normalizing effect to a justifiable degree.

In general, refract to maximum V. A. with slightly less than maximum inhibition to accommodation for hyperopes; maximum inhibition to accommodation with minimum V. A. commensurate with visual requirements, previous prescription and balance of visual functions for myopes. Good 20/30 distance vision for the latter is usually ample.

Where possible, in cases of relatively low astigmatic and spherical errors and approximate balance between the eyes, prescribe hyperopic correction for close work and myopic correction for distance use only.

The point of accommodation and convergence demand at the near point should be brought within the middle third of the total relative range of each, either orthoptically or with lenses or prisms. This is according to the theory of the "middle third" zone of comfort advanced by Percival and Sheard[4] and means that for both accommodation and convergence, the positive and negative relative values must be between the ratios of 2 to 1 and 1 to 2. In other words, the positive relative must be more than one-half and less than double the negative relative values. The amount of accommodation put forth at the near point should not exceed one-half the total amplitude available, thus

leaving at least one-half in reserve. Increase the reserve orthoptically or add plus until this balance is reached, or use a combination of both.

The amount of convergence required at the near point should not exceed one-half the total convergence available, leaving one-half in reserve. This means that the total convergence when measured from parallel must be at least double the requirement for the working distance and is equal to the convergence required from parallel to the point of fixation considering the working distance and the patient's P. D. when taking the measurement from the converged position in the usual way. Increase convergence orthoptically, or supply base-in prisms temporarily until this point is reached.

Single vision lenses should in general be centered toward the P. D. for the principal working distance. Where they are to be used for both distance and near work, it is usually better to center plus lens to the near point and minus to the far point P. D. to avoid base-out prismatic effect at either distance. The relatively small amount of base-in involved is in most cases harmless, and is tolerated better than base-out.

Bifocal lenses may be centered for the far point P. D. in the distance portion, with the segments inset to the near P. D. if there is no plus in the 180 meridian of the distance lenses. A hyperopic distance correction centered to distance P. D. has the same base-out effect at the near point with or without a bifocal segment added. This base-out prism is particularly bad for most presbyopes as they have less accommodative support to convergence; and normally manifest less convergence and a higher exophoria at near than the non-presbyope, and are therefore less able to overcome base-out prism. A small amount of base-in for relief is often necessary, and always acceptable. It is therefore important to increase the inset of the segments slightly; or decenter the distance lenses in; or do a combination of both to obtain a slight base-in effect or at least eliminate any base-out at the near point. Decentering plus lenses inside near P. D. and minus lenses out to obtain small amounts of base-in prism is beneficial in counteracting excessive convergence and as a relief measure in convergence deficiency.

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EXPECTANCY RATE OF OCULAR PATHOLOGY OF THE GENERAL POPULATION

Optometrists are sometimes prone to wonder, why physicians, who have no undergraduate training in ocular refraction, at times enter this specialized field. A field of practice separate and distinct from routine medical work. Figures recently presented by the United States Department of Labor[1] tend perhaps to throw some light on this matter.

[1]Family expenditures for eyeglasses. Report of U. S. Dept. of Labor. Optical Journal and Review of Optometry, Vol. LXXVIII, No. 1, p. 28, 1941.

Before reviewing these figures, however, it is well to briefly consider the place the physician plays in refractive matters. It is estimated that some 5,000 physicians representing different kinds of medical eye specialists at times perform ocular refractions. Some of these men are ophthalmologists, ophthalmic surgeons and eye, ear, nose and throat specialists; while others style themselves as eye physicians and medical refractionists. Of the entire group, approximately only 1,700, or about one-third, have passed any qualifying tests which indicate any real specialized graduate training in ocular matters. Of the balance, the majority are either specialists by virtue of the hospital clinical short courses in ocular training for physicians, or are specialists (?) by virtue of self appointment and aggrandizement.

Collectively this group of 5,000 physicians is said to perform about 30 per cent of the ocular refractions made in the United States today, and in addition to this they do most of the remedial work done in the field of correcting major ocular pathology. A field in which they hold undisputed possession.

The following figures indicate just why these physicians are also engaged in refractive work. Primarily they are in their respective specialties, to treat and correct ocular pathology, but as these figures show, there is so little of this work to be done, that in order to live, these men simply must perform ocular refractions, and as there are many of these to perform, they do those which come their way.

The United States Department of Labor presents figures which show a very low expectancy rate of only 8.5 persons per 1,000 of the general population, for diseases and conditions of the eye and annexa, which require diagnosis and treatment.

Now as there are 135,000,000 persons in the United States, and as the average expectancy of ocular pathology is only 8.5 per thousand, we find by a simple arithmetical process that the total annual expectancy of ocular pathology is but 1,147,500 cases. This of course includes both minor as well as major cases of eye disease.

If these 1,147,500 cases of ocular pathology all received diagnosis and treatment, equally from these 5,000 physicians who are essentially engaged in doing eye work, each of these 5,000 physicians, would each year, receive but 229.5 cases. Or an average of only 4.4 cases per week.

We know of course, that all of these pathological cases do not fall into the hands of these men. Some patients visit hospital free clinics while

others visit their family physician for help. Others resort to self-medication and others just ignore their ocular problems. These latter groups further reducing the annual intake of the physicians who specialize in ocular work.

Because of the very small amount of ocular pathology and the large number of physicians engaged in this work, it is obvious that the talents of these men must have other outlets, which as a rule are found in the refractive field of the optometrist. Carel C. Koch.

SPECIAL REPORTS

THE DENTIST FACES A PROBLEM IN OPTOMETRIC ORIENTATION*

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The background of the present problem.

Some time ago, I had occasion to discuss with dentists, and dental and medical students, the nature of the problem of cooperation in health service. In these discussions, mention was made of the fact that the optometrist today plays a part in health care. I was surprised to learn about the confusion, and rather unique viewpoints held by some, concerning the position of the optometrist in the scheme of things, i.e., in professional health service. I then felt, as I do now, that by clarifying this issue I would be contributing to a worthy public cause. I then prepared, at the request of the editor of the yearbook, an article entitled "Eye Care Through Cooperation Between Optometrist, Ophthalmologist and Dentist" which was published in 1940.[1]

I sent reprints of the above article to some of my friends, asking for their comment, in a casual way. A friend of mine, whose judgment is based on many years of experience in dentistry, public health work, and dental teaching, and especially whose opinion I hold in high esteem,

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called my attention to a concept which he attributed to me was expressed in the article. His comment was stated as follows:

"I read your article reprinted from the Year Book of Optometry, and was rather surprised to see you link the optometrist with the ophthalmologist, as though they had a proper and common function in the treatment of the eye. Personally, I feel that the optometrist should do nothing further with a case of eye disease than refer it to the ophthalmologist, and that he should be the one to decide whether the patient should be referred to the dentist for diagnosis of possible oral infection.

"In that connection (optometry), have you read the article in a recent issue of the Readers' Digest? If not, you will find it quite enlightening."

This comment called for the rereading of my own article, several times. Although the comment does not reflect my position, as expressed, I felt nevertheless with Faust, when he said:

I've studied now Philosophy
And Jurisprudence, Medicine,—
And even, alas! Theology,—
From end to end, with labor keen;
And here, poor fool! with all my lore
I stand, no wiser than before:
I'm Magister—yea, Doctor—hight,
And straight or cross-wise, wrong or right,
These ten years long, with many woes,
I've led my scholars by the nose,—
And see, that nothing can be known!
That knowledge cuts me to the bone.
I'm cleverer, true, than those fops of teachers,
Doctors and Magisters, Scribes and Preachers;
Neither scruples nor doubts come now to smite me,
Nor Hell nor Devil can longer affright me.

For this, all pleasure am I foregoing;
I do not pretend to aught worth knowing,
I do not pretend I could be a teacher
To help or convert a fellow-creature.
Then, too, I've neither lands nor gold,
Nor the world's least pomp or honor hold—
No dog would endure such a curst existence!

A new version of an old problem.

Thus now appears the problem of optometric orientation which concerns the dentist and ophthalmologist. This somewhat similar question, i.e., the place of the dentist and optometrist in health service, has been raised once before, by no less representative dentist than the late Dr. D. H. Squire, Dean of the University of Buffalo College of Dentistry. In 1925, he called attention to this very issue, which appears to be a lively topic even today. Fifteen years ago, THE OPTICAL JOURNAL, editorially commented as follows:[2]

Optometry has a closer analogy to dentistry than to medicine. There is one likeness between medicine and dentistry, however, that has no counterpart in optometry. The dentist is necessarily a surgeon, and he also makes a limited use of drugs

in oral surgery and medication. The optometrist necessarily has nothing to do with surgery or drugs as their nature is such that they are outside of the essential sphere and purposes of optometric practice.

However, the question of closer co-operation with medicine deserves the most serious consideration of optometrists. Dentistry has cordial co-operation with organized medicine and possibly even closer co-operation will come as the dental speaker suggested. Optometry has thus far been treated coldly, to say the least, by organized medicine. But the general practitioners in medicine, the family physicians as distinguished from specialists, have been getting more and more on friendly terms with the optometrists of their communities. There is much real co-operation between individuals of the two professions.

Many progressive changes have since taken place both in dentistry and in optometry. Therefore, the opening sentence in my article referred to read: "Should the dentist cooperate with the optometrist in the care of patients who are under the latter's [optometrist] care and who are referred for dental consultation?" This was a practical question and was raised as a matter of professional practice and ethics. My answer was in the affirmative, since I reported this on the basis of my experience. Patients have been sent to me by optometrists and physicians. Aside from my personal experience, my opinion was based on: (a) the advantages of interprofessional cooperation, (b) fundamental assumptions concerning professional health service, and (c) the professional status of optometry, developed along educational and legal lines.

A. Advantages of Cooperation

The specific advantages that may result from cooperation between optometrist, oculist and dentist, may be stated thus: (1) It will stimulate more thorough diagnosis of eye disorders, with possible dental involvement, (2) it will encourage the removal of suspected sources of infection in the oral cavity, in itself helpful to the patient, (3) it will increase the practice of follow-up of cases, and encourage greater individual case-study, (4) it will impress patients with the need for *periodic* eye and dental health examinations, and (5) it will promote the *practice* of prevention of disease and conservation of health.

B. Fundamental Assumptions

In the light of the dominant concept of prevention in modern medicine, the welfare of the patient should receive first consideration above everything else. It follows that: (1) Patients who are in need of eye care, whether this care lies within the domain of the ophthalmologist or optometrist, should also have possible dental and oral focal infections cleared up as a matter of professional ethics (Scientific service is here considered the basis of patient care). (2) Patients who present themselves to the optometrist or ophthalmologist for diagnosis or treatment

of their eye conditions should receive routinely a complete oral x-ray examination. The dental x-ray findings should be correlated with the clinical oral examination and be made a part of the diagnosis. (3) Eye patients should have the oral cavity put in a hygienic condition, as part of the general health examination and eye care.

C. *Status of Professional Optometry*

Although it is difficult to set up hard and fast rules for the determination of the progress of a profession, two reliable criteria have usually been accepted as satisfactory measures. These are: (a) educational and (b) legal. From these two aspects, it would appear that the scope and functions of optometry, as a profession, have been fairly well defined.

Professional duties of optometrist: The education of the optometrist imposes upon the *refractionist* certain duties of a *professional* and *ethical* character. Dealing with the qualifications and duties of the optometrist with regard to diagnosis of eye diseases, and the *diagnostic aids* needed in some instances, Koch[3] pointed out in a recent study of the question that:

> . . . . it is the duty of the optometrist to diagnose and prescribe for errors of refraction and to correct imbalances of ocular muscles. But at the same time, it is his implied duty to do these things, only after ascertaining, to the best of his professional ability the fact that the eyes upon which he is working, are free from disease or incipient pathology which should first be treated by an oculist or a physician before the optometrist corrects the visual problems which remain.

Legal aspect of optometry: Among the professions legally recognized by the State of New York is optometry. Optometry is not defined in either the 1936 or 1938 reports on higher education issued by the University of the State of New York. Apparently, the relationships of optometry to dentistry and medicine are clear and need no definition for purposes of the law.* Harlan H. Horner,[4] Ph.D., Secretary of the Council on Dental Education of the American Dental Association, in his 1938 report, as assistant Commissioner for Higher Education, had this to say about some problems that are now facing the profession of optometry in our State:

*The statutory requirements in the State of New York for the practice of optometry are given as follows: "*Education Law, Laws of* 1909, *chapter* 21, *as generally amended by the Laws of* 1910, *chapter* 140, *Article* 54, *Optometry*. 1425. Definition: application of article. A person practices optometry within the meaning of this article who by any means or methods, other than by the use of drugs, diagnoses any optical deficiency or deformity, visual or muscular anomaly of the human eye, or prescribes, provides, furnishes or adapts lenses, prisms or ocular exercises for the aid, correction or relief of the same, or who holds himself out as being able so to do. (Added by L. 1927, ch. 85. Source, former Public Health Law, L. 1909, ch. 49 sec. 300 as amended by L. 1922, ch. 245; L. 1939, ch. 916.)"

The Regulations of the Regents governing the practice of optometry stipulate that the advertisement of fixed prices is prohibited when the nature of the service rendered and the materials used must be variable. Nevertheless, there are always some optometrists who yield to the temptation of securing greater gain by an advertisement of apparent cutting of prices. There is still much to be done, but optometry may rejoice in the progress that has been made.

Concerning the relationship between optometry and medicine, which indirectly affects ophthalmology, Horner[4] says:

It is a well-known fact that the relationship between optometry and medicine is not all that could be desired. Without attempting to assess the blame for this unfortunate situation, the Department wishes to do all in its power to bring about the spirit of more friendly cooperation. During the year several conferences were held with committees of the local optometry association of one of our large counties and representatives of the county medical society. At their request, we discussed several matters in which both were interested. The Department was very hopeful that these conferences would bring about a better spirit of cooperation between the two professions. . . .

In passing, I may mention the fact—a fact not well known—that candidates for a license in optometry in the State of New York[4] must have passing grades in the following six subjects: Theoretic optics, theoretic optometry, practical optometry, anatomy and physiology of the eye, physiologic optics and practical optics.

Professional, ethical and social consideration

With the increase in the education of the public in matters of prevention of disease and the maintenance of health, we are developing a medical philosophy which considers the patient as a whole, rather than a system of organs. The patient is no longer treated for poor eyes, a bad liver, a nervous stomach, or a toothache. We are beginning to think in terms of the person, in health and in disease. More than that, we are beginning to consider the *total* person in his social and so-called "mental" environment.

Changing Conception of Health

This changing conception of health, and the methods of health care, is the result of an appreciation on the part of the established health service professions that to deal with a part adequately, we must consider the functioning whole. The health professions today, due to internal scientific growth and external social and industrial developments in our society, are face to face with interrelated problems affecting their status and service. These problems are: (a) professional, (b) social, and (c) educational in character. The optometry problem before us is of that category.

The Emerged Health Professions

With the broadening conception of the healthy and ill person came newer agencies to assist in taking care of the human mechanism. The established health professions today include: medicine and its specialties, dentistry, optometry, podiatry, nursing, public health and assisting personnel and institutions. The problems of the newer professions should be approached with a common objective in view, namely, how to benefit the largest number of: (a) the people and (b) the health practitioners. This is the ideal which American democracy strives for.

To preach the democratic way of life, we are learning, is not enough. What we need today is to practice the democratic way of living. The health professions, just like any other social group, have now a great opportunity to demonstrate the feasibility of this ideal by serving social interests first. To realize the aims of political and economic democracy, in health service, means must be found to provide the best and the most for the largest number of our people.

The Writer's Position Defined

I believe in cooperation between health practitioners. I had no reason to change this belief. Dr. Bernard Meyer has been doing splendid work with his Interprofessional Congress which meets annually. Dentists and practitioners in other branches of the healing art, should be informed of the progress and growth of the optometric profession so that the common good may be served better. I believe that cooperation in *practice* (not merely rendering lip service) will undoubtedly prove to be the most practical educational medium of the public. Cooperation in practice will demonstrate many points of contact common to dentistry, medicine and optometry that cannot be demonstrated by any other means.

It should, of course, be kept clearly in mind that the functions of the optometrist lie in *refraction* and related activities, while the ophthalmologist deals with the whole special domain of eye diseases. If health practitioners do not know what the scope, and functions, of optometry is, what may we expect of laymen—the public—to know about the various problems of inter-relationships between optometry and other branches of health service?

The problem of optometric orientation

With these introductory remarks, may I ask: "What is the problem of optometric orientation, as far as the dentist is concerned?" In

his chairman's address before the Section on Ophthalmology in 1928, Walter B. Lancaster,[5] M.D., contended that the optometry problem could be solved somewhat on the order the way the "dental problem" was solved "to the great advantage of all parties." Although I then expressed my approval on general principles of Lancaster's attitude toward the problem, I saw a distinction between the educational phases in optometry and dentistry. Lancaster may have been right then in stating:

> The great obstacle to consultations between eye physicians and optometrists is *commercialism*. The practice of optometry is too much a matter of business. *It must become a profession*. The essential basis of a profession is the *professional spirit*. This may be defined as the attitude of the members of the profession toward one another and toward the public.

It is not for me to judge the professional consciousness of optometrists. Our concern is with the optometric patient who needs eye care, and the dentist who is ready to render professional consultation and other services. I need not, at this time, deal with the anatomical and pathologic relationships that exist between mouth diseases and eye disorders and diseases. This will be dealt with in *dental orientation*, in the light of dentistry's scientific status in the healing art. What is the social and economic significance, to all concerned, in clearing up the prevailing confusion? What should be the dentist's attitude? We should be able to give a *yes* or *no* answer to the questions given below, if we are oriented in professional optometry. Let us see the reaction of the reader to the following questions:

(1) Should the dentist accept, for consultation, an optometric patient referred to him *directly* by the optometrist?

(2) Should the dentist refuse to accept, for consultation, an optometric patient referred to him directly by the optometrist? (Assuming that the dentist is not informed whether an ophthalmologist was consulted.)

(3) Should the dentist, who refuses an optometric patient (see 2) *refer back* such patient to the optometrist, with instructions that an ophthalmologist be consulted first?

(4) Should the dentist, first chosen as a consultant by the *optometrist*, be retained in this capacity by the consulting ophthalmologist? (See question 3.)

(5) Should the consulting ophthalmologist choose his own dental consultant?

(6) Should the ophthalmologist and optometrist decide on the choice of a dental consultant?

Professional ethics to be observed

There is no intention of complicating matters more than they are. The questions raised above should, however, be weighed in terms of their implications. Professional duties, independence and ethics should be recognized. Since the problem appears to be primarily a matter of ethics,* rather than economics and finances, it would be appropriate to conclude with a statement on ethics by Langley Porter,[6] M.D., Dean, University of California Medical School:

"The constant prattle about medical ethics is something to be deplored. There are no special medical ethics. Ethics are ethics. An ethical man is one who would act toward his patient exactly as he would like to have the patient act toward him if the patient were the physician and he the invalid. In other words, an ethical man is a gentleman. Exactly the same qualities of good breeding and unselfishness which mark the gentleman will also guide a doctor in his relations with his colleagues. Put yourself in his place and, as Stevenson advises, 'be gentle, be kind, and live your life so that you can be friends with yourself.' That is all a man needs to know of ethics."

DR. ALFRED J. ASGIS
7 EAST 42ND ST.
NEW YORK, N. Y.

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5. Lancaster, Walter B., The optometry problem, *Jour. A.M.A.*, 91:24, (Dec. 15) 1928.
6. Porter, Langley. Thesis and antithesis in medical philosophy, *Diplomate*, 11:5, 187-191 (May) 1939.

*In 1928, Dr. Lancaster (M.D.) predicted the professional growth of optometry in the following statement in his chairman's address: "If, as and when the optometrists organize a group of members who will set up professional standards and maintain them, consultation and cooperation will be welcomed by many eye physicians. This I firmly believe will come about.

"Eye physicians will be too conscious of the commercialism among their own members not to be charitable toward the faults and mistakes that may be made by an allied profession. This is very different from condoning the faults. Let us make it clear to the optometrists.

"I believe that the optometrists will develop a professional spirit incompatible with commercialism."

PROCEDURE AND INSTRUMENTATION

by Guy L. DuPlessis

A department wherein discussions will be carried on relative to the value of various experimental and clinical techniques as employed by practicing optometrists, and also in which the instruments used by optometrists in various phases of their work, will be subjected to some critical evaluation.

DVORINE ANIMATED FUSION TRAINING CHARTS

Dvorine has developed a new set of fusion training charts. These charts, issued by the *Animated Fusion Training Chart Company* of Baltimore, are of a design suitable for children. Their chief feature is a rectangular opening through which are exposed various drawings of objects and pictures of animals, thus explaining the title of "animated." The change of illustration on these charts is produced manually and is meant to offset the monotony of stereoscopic exercises. Each chart is available in a "right" and "left," and by reversing the card, the changeable characters are presented to the squinting eye.

The animated charts are made in three separate themes and in each subject the characters are separated by distances which vary from 4 to 8 centimeters. A preliminary test is made with a diagnostic card, which is furnished with the set. This preliminary test is made to determine the fusion position of the eyes, and successive treatment charts are used to produce greater or less divergence according to the condition treated. The animated charts are used to establish first degree fusion.

The set of charts also includes some for use in developing second degree fusion. These charts are graded in increasing stereoscopic complexity. A few charts are also included for the purpose of training third degree fusion or perspective.

The final grouping of charts consists of split card units, to develop vertical fusional amplitudes by means of vertical displacement of targets.

A booklet accompanies the complete set which outlines the procedure to be used and suggests a number of ways in which these training aids will prove useful. The makers recommend the use of these charts for home treatment as well as office practice. The charts are designed for use in any stereoscope.

Additional data on the use of these fusion training charts will be found in the book "Analytical Refraction and Orthoptics" by the optometrist, Dr. Israel Dvorine, published by the author at Baltimore.

BOOK NOTICES AND REVIEWS

Books received are acknowledged by notices in this department. Special selections will be made for more extensive review in the interest of our readers as space permits.

ESSENTIALS OF VISUAL EFFICIENCY. Prepared under the direction of the Distinguished Service Foundation of Optometry and published in 1940 by the Tuttle Publishing Company, Inc., Rutland, Vermont. This neatly bound book with paper covers has 67 pages of interesting material. A single copy is priced at 25 cents postpaid, ten copies for $2.00 postpaid, 100 copies $17.50 and 1000 copies at $160.00 F.O.B. They may be ordered by addressing the Distinguished Service Foundation, South Royalton, Vt.

This publication is distinguished by two factors. First, it represents a distinctly optometric contribution to the conservation of vision of the school child. Second, since it is a publication of the Distinguished Service Foundation of Optometry it is the product of cooperation between optometrists and a number of scientists connected with varied institutions.

This book is a manual on the fundamentals of visual efficiency for teachers and school authorities. It begins with a chapter devoted to the historical development of the seeing problem and carries on in the next chapter with a discussion of the importance of the teacher and her subjective correlation between poor scholastic attainment and visual inefficiency. In the third chapter the factors involved in visual efficiency are discussed with particular emphasis upon the marked depression of scholastic attainment by near point deficiencies as compared with the relatively less significant correlation between visual acuity at distance and achievement.

Several chapters are devoted to light, glare, illumination of the school room by natural and artificial light and seating arrangements to secure maximum visual efficiency with natural and artificial light. Two chapters are devoted to explanation of common visual errors and their relation to vision, visual efficiency and academic attainment. The last chapter offers a screening test for visual errors which can be used by the teacher. This interesting book concludes with an addendum on visual aspects of highway safety for children.

Dr. Don R. Paine, past chairman of the American Academy of

Optometry recommends this publication in the following words, "This book represents a very superior type of interprofessional service and it is one which will do optometry great credit. It is valuable because it is so comprehensive and so clearly elucidated on all matters related to visual conservation and education, and it should be accepted as valid material because of its background of research on most of the elements presented."

C. W. Morris.

ABSTRACTS

A department in which will appear abstracts of the literature of optometry, ophthalmology and applied optics. These will be classified according to the following list, although contributions to all sections will not necessarily appear in each issue.

1. Ocular Refraction.
2. Physiological Optics and Color Vision.
3. Ocular Muscles.
4. Orthoptics and Reading.
5. Anatomy, Histology and Embryology.
6. Ocular and General Pathology.
7. Ophthalmic Lenses and Material.
8. Instruments.
9. Hygiene and Illumination.
10. Applied and Physical Optics.
11. Education, Sociology and Economics.
12. Miscellaneous.

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1. OCULAR REFRACTION

MYOPIA: A SUGGESTION FOR ITS CLASSIFICATION AND TREATMENT. Harding, C. L. Dioptic Review and British Journal of Physiological Optics, 1940 (New Series), 1, 3, 203-213.

Harding classifies myopia as follows: (1) Hypertonic myopia; this being a form of myopia in which the crystalline lens and accommodation are involved. He further subdivides hypertonic myopia into (a) astigmatic-myopia, (b) occupational myopia, (c) innervational myopia, and (d) associated myopia. (2) Fibrillar myopia; this being a form of myopia in which the anterior-posterior diameter of the eye is enlarged due to a breakdown of the fibroblasts of the sclera. Harding subdivides fibrillar myopia into (a) hereditary myopia, (b) infantile pyretic myopia, and (c) dietetic myopia. (3) Degenerative myopia; this being a form of myopia associated with pathological problems. The article reviews the various treatment procedures suggested for myopia and presents several case reports C.C.K.

ERRORS OF REFRACTION AND VISUAL HABITS. Nott, I. S. Canadian Journal of Optometry, 1940, 2, 3, 81-83.

Nott suggests a period of accommodative reconditioning for all

patients, in which it has been necessary to prescribe new refractive prescriptions, which are at considerable variance from the ones previously used by these patients. Several case reports are included. C.C.K.

SIGNIFICANCE OF BETT'S TESTS OF VISUAL EFFICIENCY. Fry, Glenn A. Optometric Weekly, 1940, 31, 24, 677-608.

Fry reviews an investigation made by him in which an analysis is made of the relative value of the Betts Keystone DB 1, 2 and 3 visual efficiency cards as compared to the Snellen test in measuring visual acuity. Fry finds (1) that these stereoscopic cards cannot be regarded as equivalent to the Snellen tests used in taking visual acuity because it is impossible to predict the scores in one test from the scores of the other, so far as a given individual is concerned. (2) That these tests introduce the factor of physiological awareness of nearness which he finds modifies the visual acuity findings, and (3) in the use of these stereoscopic cards, from 7△ to 9△ of convergence is brought into play, thus in some cases at least, also affecting the visual acuity readings. C.C.K.

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2. PHYSIOLOGICAL OPTICS AND COLOR VISION

SOME FUNDAMENTAL PHYSIOLOGIC PRINCIPLES IN STUDY OF THE VISUAL FIELD. Bair, H. L. Archives of Ophthalmology, 1940 (July), 24, 10-20.

The author classifies study of the visual field as: (1) topographic and (2) quantitative, the former dealing with the shape and extent of field defects and the latter with their density. Either may be achromatic or chromatic, according to whether white or colored test stimuli, respectively, are employed. It is stated that study of the visual field in the presence of uncorrected ametropia and refractional aberrations is more reliable with the use of larger test stimuli (than usually recommended for isopter determinations) and lower levels of adaptational, background brightness. This method of examination under a low background illumination is more delicate and accurate than the ordinary method of examination at relatively high levels of light adaptation and minimizes certain technical difficulties in refined examination. Certain beliefs concerning the interpretation of color fields are considered incorrect and the author attempts to explain them according to the normal physiology of color perception throughout the field. R.J.B.

STEREOPSIS AND DEPTH PERCEPTION. Higley, H. R. Columbia Optometrist, 1941, 15, 57, 2.

Higley points out that stereopsis and depth perception are not the same thing and that the two terms should not be used synonymously. The paper deals with depth perception and an instrument called a Depthescope which was developed by the author to measure this. Twelve case reports are included showing the diagnostic value of this device.

C.C.K.

TESTS FOR COLOR BLINDNESS IN NEW YORK CITY SCHOOLS. Thomas, R. K. Associated Journal of Optometry, 1940, 5, 8, 24.

Four thousand students in 17 Junior High Schools in New York City were examined for color blindness. The Ishihara test plates were used. Five per cent of the boys and one-half per cent of the girls failed to pass the tests which were conducted by the Board of Education.

C. C. K.

REPEATABILITY OF OPHTHALMOEIKONOMETER MEASUREMENTS. Ogle, K. N., Imus, H. A., Madigan, L. F., Bannon, R. E., and Wilson, E. C. Archives of Ophthalmology, 1940, 24, 1179-1189.

"One of the important steps in the study of aniseikonia has been the determination of the repeatability of the measurements of the difference in the sizes of the ocular images of patients by different clinicians by means of independent examinations on different ophthalmoeikonometers, not only at a given time but after the lapse of a period of time." The analysis of the repeatability tests indicates definitely that the use of the ophthalmoeikonometer with the polarized eikonic targets is reliable for measuring differences in the sizes of ocular images at distant vision. The tests in the horizontal meridian at near vision are less reliable, and considerable judgment is necessary to evaluate the findings obtained. A random selection of subjects on whom remeasurements were made after the lapse of a period of several years showed a good repeatability and thus gave evidence for the stability of such differences. R.J.B.

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3. OCULAR MUSCLES

THE SCREEN TEST AND ITS MODIFICATIONS, SCREEN-MADDOX ROD AND SCREEN-COMITANCE. White, J. W. American Journal of Ophthalmology, 1941, 24, 156-160.

The author maintains that the screen or cover test can be accurately applied in all cases, that it more completely breaks up the fusion and convergence impulse, that intimate details revealed by it will make the diagnosis more certain and the corrective procedure more definite, and that it will give a keener appreciation of variations in motor anomalies than is obtained through any other means. The technique of the screen test is described together with its use when fixation is at various distances and in the six cardinal positions. Its use in determining the fixating eye and in correcting vertical deviations and double hyperphoria is outlined. The subjectivity of the parallax test seriously limits its general use, although with cooperative patients it proves quite sensitive. The screen-Maddox rod test is of especial value in hyperphorias and in detecting differential effects when the rod is alternately placed over either eye. In the screen-comitance test, the screen is held in such a way that, while the patient sees the object with only one eye at a time, the examiner is observing the movements of both eyes. This test should be made in the six cardinal positions. With it, secondary deviations may be observed.

R.J.B.

WHAT IS THE MINIMUM ROUTINE EXAMINATION OF MUSCLES? White, J. W. Archives of Ophthalmology, 1940, 24, 1113-1122.

White suggests the following routine examination, each point to be considered in detail: (a) history (including observations by the examiner, e.g., head tilt and other characteristics) (b) visual acuity, (c) refraction (noting its effect on muscle balance), (d) accommodation (monocular and binocular amplitudes), (e) deviation for distance (in the six cardinal directions), (f) deviation for near vision (in the six cardinal directions), (g) convergence near point. Illustrative principles of the various tests are given to clarify diagnostic considerations. "The determination of these points are all that is necessary to a diagnosis. Tests may be made to confirm or to check the results of the routine tests, and when a diagnosis is made additional tests may be used for further evidence on a definite point."

R.J.B.

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4. ORTHOPTICS AND READING

THE ROLE OF THE PARENT IN THE READING PROBLEM. Betts, E. A. Pennsylvania Optometrist, 1941, 10, 1, 7-9.

Betts reviews the reading problem from the standpoint of the parent, and makes the following suggestions, which when carried out, will in his judgment, assist in solving this problem. (1) Kindergarten training for every student. (2) Parents should be cautioned against forcing their children into first grade reading activities when they are too young for these. (3) Parents should be cautioned against forcing their children into reading activities which foster the development of undesirable reading habits. (4) Teachers need to be given more freedom in the selection of books to meet the needs of pupils, and (5) the health needs of the student must be thoroughly met. C.C.K.

GRAPHIC RESULTS IN FUSION TRAINING. Forsyth, W. W. Canadian Journal of Optometry, 1941, 2, 9, 275-277.

In this paper Forsyth describes the maddox cheiroscope and reviews its uses, as an aid in fusion training. Several case reports are included.—C. C. K.

TREATMENT OF MYOPIA. Walker, H. Optician, (London), 1940, 99, 2568, 303-304.

Base-in prismatic corrections for near-point work; relaxation exercises with base-in prisms; adrenalin drops 1-2000, and hygienic advice as to ocular habits constitute the treatment regimen of Walker in myopic cases. Some 16 case reports are presented. Walker feels the procedure outlined in treating these myopic cases should be continued.

C.C.K.

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6. OCULAR AND GENERAL PATHOLOGY.

PHYSICAL MEASURES IN OPHTHALMOLOGY. Nugent, O. B. Eye, Ear, Nose and Throat Monthly, 1941, 19, 363-366.

Physical therapeutic agents employed as aids in the management of certain diseases of the eye and its adnexa are the same as those used to treat diseases of the body in general. Apparati and techniques are modified to suit the smaller structures. Among the agents considered in this paper are cold and heat therapy. Methods and purposes of the various

agents are discussed together with the conditions or diseases for which they are indicated. The following agents are discussed: infra-red therapy, diathermy (non-surgical and surgical), ultra-violet radiation, Roentgen therapy, Grenz ray therapy, radium therapy and fever therapy. The field of application of these agents is wide in ophthalmology but their contraindications must be thoroughly recognized and their limitations appreciated. R.J.B.

FUNDUS CHANGES IN ARTERIOSCLEROSIS. Tower, P. Optical Journal and Review of Optometry, 1940, 77, 21, 20-21.

Fundus changes and ocular complications in arteriosclerosis are reviewed by Tower, who divides the ophthalmoscopic signs of retinal arteriosclerosis into three classes, (1) arterial signs, (2) venous signs, and (3) arterio-venous signs. The author describes the fundus picture in each group and reviews the pathology indicated by these departures from normal. The paper is an abridgment of the illustrated material presented before the Los Angeles County Optometric Association. C.C.K.

THE HYPOFUNCTION OF THE LACRIMAL GLAND. DeRotth, A. American Journal of Ophthalmology, 1941, 24, 20-25.

Attention is called to a group of patients, women in normal or artificial menopause, about 0.4 per cent of the author's cases, who suffer from light sensitiveness and burning of the eye; they become easily tired when reading and show practically no clinical symptoms. Their common symptom is very low lacrimal production. These cases are considered to differ only in degree from those of keratoconjunctivitis sicca and filamentous keratitis. While lacrimal production decreases with age other causative factors might be, for example, disturbance of the trophic nerves of the cornea, ovarian hypofunction, vitamin-A deficiency, and a qualitative change in the tears. R.J.B.

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7. OPHTHALMIC LENSES AND MATERIAL.

THE ORIGINS AND DEVELOPMENT OF CONTACT LENSES. Pascal, J. I. Optical Journal and Review of Optometry, 1941, 78, 2, 57.

The first contact lenses, made in 1887, were used as eye protectors.

It was not until 1908 that the device was used to improve vision. Pascal presents an historical review of the subject from its earliest beginnings, up to the present plastic lens. C.C.K.

PLASTICS AND THE OPTICAL INDUSTRY. Trevor, J. S. Optician. (London), 1940, 99, 2561, 187.

This paper deals with ophthalmic frames made from cellulose acetate. The author finds these frames to be of value because (1) the frames have dimensional stability, (2) have long life, (3) have resistance to acids, (4) are low in moisture absorption, (5) are light in weight, (6) are non-conductive to heat, (7) are available in a wide color range, (8) are non-inflammatory, and (9) have easy working properties.

C.C.K.

CALIPERS FOR CONTACT LENS FITTING. Even, A. N. Optometric Weekly, 1940, 31, 29, 817.

Even suggests the use of a series of templates for measuring the surface curvature of the sclera in fitting contact lenses. These templates he claims can be made of plastic material, accurate to 1/100 of a mm.

C.C.K.

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8. INSTRUMENTS.

THE HISTORY OF THE OPHTHALMOSCOPE. Poser, M. Optical Journal and Review of Optometry, 1941, 78, 2, 106.

Early ophthalmoscopic experimentation by von Helmholtz, is first reviewed by Poser, who then describes the Loring (1869) instrument. This being the first practical clinical ophthalmoscope used in daily diagnostic work. Poser then mentions a number of later instruments each showing some advancement in ease of technique or diagnostic value. The paper reviews the progress made in ophthalmoscopic design up to the present day modern Friedenwald and May hand instruments and the Gullstrand, with its photographic and drawing attachments.

C.C.K.

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9. HYGIENE AND ILLUMINATION.

SURVEY OF RESEARCH ON NIGHT DRIVING IN RELATION TO VISION. Lauer, A. R. and Silver, E. H. Optometric Weekly, 1941, 32, 4, 91-95.

Night and day accident rates are presented and the authors conclude that excess night accidents are due to drivers of motor cars not seeing the hazard in time; this being due to poor illumination and low contrast ratios.

C.C.K.

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11. EDUCATION, SOCIOLOGY AND ECONOMICS.

A NEW CONCEPT OF VISUAL PERFORMANCE IN INDUSTRY. Kuhn, H. S. Sight-Saving Review, 1940, 10, 4, 273-282.

Industrial machine efficiency now demands the utmost in human efficiency. Visual and aptitude tests must become part of the selective program for workers in industry. Employees who pass tests for visual acuity, depth perception, muscle balance and color deficiency are better and safer workers. C.C.K.

ESTABLISHMENT OF EYE-CARE CLINICS. Jeffrey, C. O. The Indiana Optometrist, 1941, 13, 1, 7-9.

Jeffrey reviews the steps to be taken in establishing a free outpatient eye-care optometric clinic for the under privileged, by a local optometric society. Clinics such as those now operating in Omaha, Oil City, etc., are presented as examples. C.C.K.

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12. MISCELLANEOUS.

EYE EXAMINATION OF COMMERCIAL PILOTS. McKnight, H. Optical Journal and Review of Optometry, 1940, 77, 20, 18-21.

McKnight, as medical director for America Airlines, Inc., reviews the visual tests given commercial pilots by flight surgeons. These tests are (1) monocular visual acuity test using Snellen charts. (2) Depth perception tests using the Howard apparatus. (3) Tests for hyperphoria, using the maddox rod and prisms. (4) Color vision using the Ishihara plates and the Holmgren yarns. (5) External inspection of the eyes, and (6) an ophthalmoscopic examination of the media and fundus. Each of the six steps in this examination is reviewed in detail. Commercial pilots must have a monocular visual acuity of at least 20/20 without correction; a depth perception of 30 mm. or less; no diplopia; a hyperphoria of not to exceed 1△; normal color vision and eyes free from pathology. C.C.K.

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

by J. Fred Andreae, Secretary

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

ACADEMY BREAKFAST AT ATLANTIC CITY

Arrangements have been made to hold an Academy breakfast at Atlantic City, New Jersey, the morning of June 30th, 1941. This breakfast will take place during the Annual Congress of the American Optometric Association. A round-table discussion of some of the organization problems affecting the profession will follow the breakfast. President Wheelock of the Academy will preside at this meeting and all members of the Academy in attendance at the congress are invited to attend. Reservations should be made through the office of the Secretary.

PRELIMINARY ANNOUNCEMENT OF ANNUAL MEETING OF ACADEMY

The first week in December, 1941, has been selected as the period for the annual meeting of the American Academy of Optometry. This meeting will be held at Chicago, Illinois, at such place to be announced at a later time. The preparations for this meeting are now being made and those members of the Academy who expect to present technical papers are requested to notify the chairman of the Program Committee, Dr. D. G. Hummel, 419 Guardian Building, Cleveland, Ohio, at once.

INSTRUCTION AS TO THE PREPARATION OF CLINICAL CASE REPORTS FOR OPTOMETRISTS WHO WISH TO QUALIFY FOR FELLOWSHIP IN THE ACADEMY.

As the preparation and submission of clinical case reports is one of the requirements for admission to membership in the Academy and because there has been some confusion as to just what form this material should take, prospective applicants are requested to adhere to the following instructions, in writing up these reports.

PREPARATION OF CASE REPORTS

In the interest of uniformity and to facilitate review, the following arrangement schedule has been adopted for reporting case studies. No report will be accepted unless all instructions have been carried out in full.

GENERAL INSTRUCTIONS

All reports must be in the office of the secretary at least THIRTY (30) days prior to date of examination.

Reports, together with field charts, graphs, and drawings, must be in duplicate. All reports, graphs, etc., become the property of the American Academy of Optometry, and will not be returned to the candidate.

The Examining Board will not accept the responsibility for loss of reports *in transit*.

SPECIFIC INSTRUCTIONS

Case reports and all supplementary data must be neatly typewritten on 8½ x 11 inch paper. All graphs, charts, etc., concerning the report should be included in proper order. Each page must be numbered, and bear the name and address of the candidate in the upper right hand corner.

Reports should contain not less than 1,000 words and not more than 2,500 words.

ARRANGEMENT

The cover sheet of each report must bear the following:

1. The general type of report (refractive, orthoptic, or pathological).
2. Patient's initials and address.
3. A brief summary of the case (not more than ten lines).
4. Your name and address.

TYPES OF CASES

Reports must be of patients seen in the candidates own practice and may include:

1. Errors of refraction.
2. Muscle imbalances, squint, or amblyopia.
3. Reading problems and reconditioning.
4. Pathology.

GENERAL CONSIDERATIONS

All reports should include the previous history and complaints at

time of examination. The refractive findings must be described in conformance with those in the Outline of Clinical Examination, and must be designated whether gross or net. Procedures and observations which led to the final prescription or advice should be stated as clearly and briefly as possible.

If the report is one of pathological nature, it must be fully and concisely described, giving your diagnosis, together with the diagnosis, name, and address of the ophthalmologist to whom the case was referred. Reports of pathological cases should include a line or two as to the final disposition of the case.

Reports on orthoptics must be brief and clear, giving dates of first and last conditioning periods, reasons for procedure adopted and final results.

SUMMARY

A summary of the important phases of each case should be included in the report. This summary should indicate the reason for the particular procedure selected, and should be sufficiently broad as to indicate knowledge of other and alternate methods.

CORRESPONDENCE

MONOCULAR BIFOCAL LENS FOR PRESBYOPIC RIFLEMEN

To the Editor: These comments are suggested by your recent editorial[1] dealing with presbyopic vision and rifle fire. In Wisconsin a considerable portion of the male population engages in hunting or shooting at some time of each year. For this reason the problem of presbyopia and rifle fire is not a new one.

In the writer's judgment, there are stages of presbyopia which do not receive sufficient aid from a conventional lens correction. Many of these patients will derive satisfactory results in using a marksman's glass. The most appropriate lens for this purpose is a small segment bifocal†

[1]Koch, Carel C. Rifle Fire and the Presbyope. American Journal of Optometry and Archives of American Academy of Optometry, 18, 2, 84-85, 1941.

†Petry points out that the monocular bifocal does not always work. He cites a case of a man, age 34, who had about 6.00 diopters of amplitude accommodation through his distance correction which happened to be in the range of —6.00 diopters. This patient tried the monocular bifocal without success and Petry wonders whether in strong corrections the marginal astigmatism enters into this, because the part of the lens that is used by the rifleman when aiming is in that peripheral upper nasalward sector which besides being far enough from the optical center of the lens, also receives the light through the sight at an extremely oblique angle. Petry suggests for these patients with strong corrections that perhaps a multiple pinhole spectacle might be of assistance.

which is placed before the dominant or sighting eye only. The small round bifocal segment is located in the lens surface, nasalward and usually on the seeing-line, in a position which places it directly before the patient's pupil when sighting the rifle.

The technique of prescribing this monocular bifocal is as follows: The eyes are refracted for infinity in the usual manner. The patient is then requested to return with his rifle. With the far-point prescription in a trial frame, he is then directed to sight the rifle at some distant object. While he is so doing, the optometrist adds convex sphere until the rifle sights are clear. Care must be taken to add only the weakest convex lens which sufficiently clears the sights without too severely blurring the target. Trial and error will determine the desired convex lens best suited in each case.

The optometrist next selects the frame to be used. Into this frame is placed any lens, and the glasses are placed upon the patient's face. The patient is again instructed to sight the rifle. While he is so doing, the location of the bifocal segment can be obtained by inking the entire lens with the exception of the small sighting area. The clear area on this trial lens represents the position of the final bifocal segment on the finished lens. The non-dominant eye is given a distance correction only.

Upon first thought one might anticipate that the additional plus in this monocular bifocal segment would interfere with the distance vision of the patient. However, in actual practice this is not the case, due to the fact that most rifle sights are of the peep variety which are in reality a pinhole disc.* This lessens the blur we have created for distance while allowing the bifocal addition to clear the rifle sight itself.

DR. A. N. ABBOTT,
SHAWANO, WISCONSIN.

*In this connection Ryer points out that in using rifles equipped with a pinhole peep sight that this device should assist in clearing both the rifleman's distance vision as well as his view of the foresight of the rifle, and therefore no bifocal segment would be necessary. It should be kept in mind, however, that military rifles do not have peep sights as standard equipment.

Current Comments by Carel C. Koch

A Monthly Department

in which the Editor of the AMERICAN JOURNAL OF OPTOMETRY & ARCHIVES OF THE AMERICAN ACADEMY OF OPTOMETRY will discuss items of news of general interest; such as relate to new instruments, clinical techniques, education, public health, and optometric legislative and organization problems.

ENUCLEATION FOLLOWING OPERATION FOR MEIBOMIAN CYST

The patient, a woman, engaged a physician, whom it developed, was not a specialist in diseases of the eye, to remove either a chalazion or meibomian cyst from her eyelid. The physician advised her that this could be done by a slight operation without causing pain or affecting her sight. He averted the eyelid, made an incision and scraped out the cystic material with a curet. He then, it is reported,[1] applied hydrogen peroxide and a 5 per cent solution of mild protein silver, placed a bandage over the eye and instructed the patient not to touch the bandage, or her eye, to thus prevent infection.

The patient reported daily for treatments for almost two weeks. At the end of this period she was transferred to the care of a second physician as the first wished to leave the city to attend a meeting. Up to the time he left, the patient had been assured by the original physician that she was "doing nicely" and that the seat of the operation was not infected. The original physician admitted later, however, that several days before his departure he had observed a white cloudy circular ring in the iris of the patient.

The patient then visited the second physician to whom she had been sent. He found the eye completely inflamed and refused to treat her, sending her instead to a third physician, who had had ocular training. In spite of treatments by this specialist the condition became worse and the eyeball had to be removed. The patient later entered malpractice proceedings against the first physician, receiving a judgment in her favor in the courts of Tennessee. The case is of interest to optometrists only as it indicates the wide spread scope and character of ophthalmic work done by some medical men who are untrained in ocular matters.

[1] Report of Bureau of Legal Medicine, Journal of the American Medical Association, Vol. 115, No. 18, p. 1576, 1940.

LICENSES FOR OPTICIANS

In California, dispensing opticians practice under the regulations of a statutory act. In New York State, dispensing opticians are again seeking registration to place their calling under educational laws. These opticians are asking the legal right to adjust, fit, service, furnish and adapt lenses, spectacles and eyeglasses, optical devices or other optical appliances in accordance with prescriptions issued by optometrists or physicians. And at first glance this all seems harmless enough. Yet even a superficial analysis of the matter coupled with the experience already gained in a trial of this practice in California, leads this observer to suggest a note of caution in the optometrical endorsement of such schemes.

Cohen[1] has pointed out that in the past the proponents of this type of legislation have been unfriendly to the sociological and economic problems of optometry, and have attempted, wherever possible, to divert refractive cases away from the care of optometrists. This being true, one wonders therefore, why our optometrical societies should now be called upon to assist these opticians in their new venture.

He points out also the fact that in New York State dental mechanics were at one time legalized and that the profession of dentistry found this regulation and registration so unsatisfactory that the law was repealed at their request. The similarity of position of the dentist and the dental mechanic and the optometrist and optician is, the writer believes apparent.

Since the passage of the opticians' registration act in California, the situation relative to the dispensing of ophthalmic material has not improved. In fact, many observers are of the opinion that the citizens of that state have never been as indifferently served as they are today. This being true, there is some question as to the advisability of optometrical endorsement of such legislative proposals. Particularly as these proposals should only be made when it is most clear that public welfare will gain thereby and that these are not made for the sole benefit of the optician.

In this the writer doubts that such legislation would result in better service to the public. In fact, the licensing of opticians would probably add materially to the confusion which already exists relative to ocular matters in the minds of many of the public. The confusion resulting from the practice of physicians who refract, the optometrists, and the

[1]Cohen, M. The Optician Bill. Journal of the New York State Optometric Association, 8, 7, 126-127, 1941.

unlicensed dispensing opticians who now do our laboratory work. Grant this latter group legislative status and the public will be further importuned by these merchant-mechanics to seek the services of the newly licensed opticians, believing when they did visit the optician, that their entire refractive problem could be met.

The growing practice of state regulation for opticians is one which will require on the part of optometry much additional study and careful supervision. Today the optometrist is charged at law with the proper conduct of the entire refractive field. The writer doubts whether the time has arrived to share this responsibility with the untrained dispenser who is guided in his dealings only by the so-called ethics of business.

MIDDLE ATLANTIC EDUCATIONAL CONGRESS

A meeting of the Middle Atlantic Educational Congress will be held at the Roosevelt Hotel, Pittsburgh, Pennsylvania, April 27 to 29, 1941. Drs. Emmett A. Betts, A. M. Skeffington, William Feinbloom, H. Ward Ewald, Jr., Raymond Bontrager, Marguerite Thoma Eberl and Margaret E. Brennan will present material dealing with refractive, orthoptic and reading problems.

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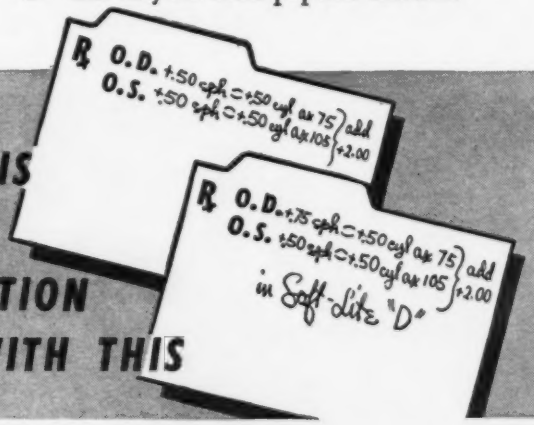

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